

Overview

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At Indiana University Indianapolis, graduate and professional education is more than a single program, it's a gateway to advanced study across a wide range of disciplines. Whether you're pursuing research, professional advancement, or specialized expertise, IU Indianapolis offers pathways designed to support your goals and expand your impact.

Graduate School programs are typically research-focused, culminating in a thesis or dissertation that contributes new knowledge to your field. Alongside these are professional degrees that prepare students for leadership and practice in a variety of industries.

Each program is housed within a specific school or department, where you will find detailed information about curriculum, admissions, and faculty. To explore the full range of opportunities, prospective students can browse the complete listing of [graduate and professional programs offered through IU Indianapolis](#).

Indiana University Indianapolis Graduate School

At Indiana University Indianapolis, more than 8,000 graduate students pursue over 300 certificates and degrees—advancing their careers, deepening their expertise, and shaping what comes next.

The IU Indianapolis Graduate School is your central resource for graduate education. We champion student success from your first step toward applying through graduation and beyond ensuring a high-quality, inclusive academic experience at every stage.

We support you by:

- Guiding you through application, admission, and enrollment
- Helping you stay on track to degree completion
- Ensuring your thesis or dissertation meets university standards
- Providing resources for academic success, mentoring, and professional growth

Beyond academics, we help you build community and momentum. From workshops and events to leadership development and mentoring through the Graduate Mentoring Center, we offer opportunities that extend your learning beyond the classroom.

The Graduate School works closely with campus leadership and faculty through key committees that shape curriculum, fellowships, and recruitment while ensuring your education stays relevant and impactful.

Most importantly, we're here for you. Whether you're exploring programs or completing your final requirements, the IU Indianapolis Graduate School is your go-to source for answers, support, and next steps.

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Admission

Applicants should navigate to the website of their graduate program of interest to obtain the most program-specific requirements and deadlines. The following bulletin pages provide general information about various programs on the IU Indianapolis campus.

- [Indiana University Graduate Programs](#)
- [Graduate Non-Degree Programs](#)
- [Accelerated Degree Programs](#)
- [Professional Programs](#)

IU Indianapolis Graduate School Programs

Undergraduate Requirements (All Admission Categories)

The Indiana University Indianapolis Graduate School will consider applications from students holding bachelor's degrees from regionally accredited four-year collegiate institutions. The Graduate School may admit students who do not meet stated admission criteria provided that the deficiencies amount to no more than one year's work. The dean of the Graduate School will determine the condition of admission in such cases. If more than a year's work is deficient, students should apply to the Graduate School for admission to the continuing non-degree program. Students from unaccredited or nationally accredited institutions may be admitted as a graduate non-degree student (GND) for one semester; if their records are satisfactory and their department, program, or school recommends them, they may apply to a Graduate School program. Ordinarily, a B (3.0) minimum grade point average in an undergraduate major is required for admission to the Graduate School. Students with a grade point average below 3.0 may consider the GND program as an option to prove they can be successful in graduate school and, therefore, be considered for admission upon exemplary performance in their courses taken as a GND student.

The Graduate School recognizes the role in contemporary curricula of modern technologies that enhance learning in both traditional formats featuring primarily face-to-face interaction and in non-traditional formats where students and faculty engage each other primarily via electronic means. In considering coursework for admission purposes or for transfer of credit into a degree program, the Graduate School expects programs to evaluate course work and to apply the same criteria for quality to both traditional and distance formats. Course work must be from an accredited four-year collegiate institution to be considered for admission purposes or must otherwise comply with the requirements for nonaccredited institutions.

Indiana University Baccalaureate Degree Candidates

Candidates for baccalaureate degrees at Indiana University may apply for conditional admission to the University Graduate School and may enroll for graduate credit for that portion of their program not required for completion of the baccalaureate degree, provided that:

1. They are within one semester of meeting baccalaureate degree requirements, or they are admitted to an accelerated graduate program and

enrolled in courses required for the graduate portion of their degree plan (if the baccalaureate is not completed within that semester, graduate credit earned may not be counted toward an advanced degree).

2. The total course load does not exceed that ordinarily taken by a full-time graduate student.
3. The courses taken for graduate credit are authorized to carry such credit. (In certain instances, graduate credit is allowed for undergraduate courses.)

Application for Admission Graduate Degree Programs

Prospective graduate students, including graduates of Indiana University, must make formal application via the online application portal

To ensure that course credit will be eligible to count toward an intended graduate degree, prospective graduate students, including graduates of Indiana University, must make formal application and be admitted.

Admission (except for visiting and continuing graduate non-degree students) is made to a particular department or program for a specific degree, and no student shall be permitted to work toward a degree without first having been admitted. Admission decisions are made after review by the department or program and final approval by the dean of the Graduate School. Students who want to change programs should contact their current department or program to notify them of their intent. Students must apply and be admitted to the new program.

Most programs of the Graduate School consider applications for admission and financial aid that are completed by the following dates:

- January 15 for the fall semester
- September 1 for the spring semester
- January 1 for the summer

Applicants are responsible for reviewing the program's website for current deadlines and requirements. Many graduate programs consider applications submitted after a deadline as long as all available spaces for students have not been filled by highly qualified applicants. Inquiries about late applications for admission or financial aid should be addressed to the program of the student's intended major.

Online applications are normally sent to the departments or programs for consideration within two working days, but the review and approval process may take several weeks. Applicants should navigate to the department's website to obtain the most program-specific instructions and dates and should navigate to the online application through the [IU Indianapolis Graduate School website](#). A listing of all 300+ graduate certificates, graduate, and professional degrees can be found on the [IU Indianapolis Graduate School graduate programs' website](#).

All applications must be accompanied by transcript(s) of all previous and current college and university course work. Admission to IU Indianapolis may be granted with unofficial transcripts, but students are required to provide official transcripts to the Graduate School in order to continue enrollment past the first semester. Transcripts submitted to IU directly from the university are considered official. Applicants should request electronic transcript

delivery when possible, or have paper transcripts mailed directly to the Graduate School at:

University Library, Room 1170
755 W. Michigan Street
Indianapolis, IN 46202

Transcripts issued to the applicant or printed from student portals are not considered official. Questions regarding this policy can be directed to (317) 274-1577 or gapiui@iu.edu.

Following the notice of admission to the Graduate School, an applicant normally has two calendar years in which to enroll as long as the program and Graduate School are properly notified. Supplementary transcripts of any additional academic course work undertaken during that period are required, and a department may request additional letters of recommendation. Should the updated material prove unsatisfactory, the admission may be canceled. If the applicant fails to enroll within two years, a completely new application is required. Applicants to IU programs may defer their admission decision up to 1 year at a time and up to two times during the two-year period.

Application Requirements

Electronic applications are the only form of application except where accommodations are needed.

By action of the Trustees of Indiana University, a non-refundable application fee of \$70.00 is required of all applicants, with the exception of the Dental program which is \$80.00.

Acceptance to an Academic Program

Admission (except for Continuing/Graduate Nondegree students) is made to a particular department for a specific degree, and no student shall be permitted to work toward a degree without first having been admitted to do so. A flexible entry procedure for basic science programs at Indianapolis allows Ph.D. students up to one year to identify a research laboratory and degree program. Students desiring to change departments must apply and be admitted to the new program. Requests for change of degree status must be submitted by the department and approved by the dean of the Graduate School.

Following the notice of admission to the Graduate School, supplementary transcripts of any additional academic work undertaken during that period are required. Should the updated material prove unsatisfactory, the admission may be canceled. If the applicant fails to enroll within the terms of admission, a completely new application is required.

Graduate Record Examination (GRE)

Applicants may be required to take the Graduate Record Examination General Test, Subject Test, or both (see the department or school sections of this bulletin). Information concerning these examinations may be obtained from the [Graduate Record Examinations Educational Testing Service](#).

International Candidates

International candidates should contact the program that they are applying to for program-specific application requirements, instructions, and deadlines.

International graduate applicants are expected to have completed the equivalent of a U.S. bachelor's degree to be considered for graduate study, such as:

- Have completed at least 16 years of primary + secondary + tertiary education and have earned a university first degree, or
- Have completed a university first degree that grants eligibility for graduate study in a recognized university in that same country.

Persons without this background cannot be accepted for graduate study, regardless of the name of any first degree they may hold.

The International Admissions team at IU Indianapolis will provide evaluations of the applicant's educational background and academic documents upon request from the departments. Once minimum eligibility is determined, Indiana University graduate programs and then the Graduate School will make the final admissions decision, based on reviewing the applicant's educational credentials to determine if the applicant is academically competitive and has the preparation needed for success in that program.

Applicants from non-English speaking countries must prove English proficiency and may be required to take a standardized English proficiency test, such as the Test of English as a Foreign Language (TOEFL) or the International English language testing system (IELTS) examination to qualify for graduate study at IU Indianapolis; many graduate programs require a score significantly higher than the minimum campus standard. The IU Indianapolis website offers further information on [English proficiency requirements](#).

Graduate and professional students who are notified as part of the admissions process that they are required to complete the English for Academic Purposes (EAP) Placement Assessment must complete the assessment upon arrival and before enrolling in their first semester of coursework, unless exempt under campus policy.

Based on the results of the assessment, students may be placed into English for Academic Purposes coursework. Students placed into EAP coursework must enroll in the prescribed course(s) beginning in their first or second semester of enrollment.

Additional English language assessments may be required for students appointed to instructional positions, such as Associate Instructors, in accordance with applicable university and campus requirements.

Visiting Intercampus Students (Students from another campus within the IU system)

Visiting students who are eligible for a temporary intercampus transfer (ICT) must be active in a graduate/professional degree-seeking program at another Indiana University campus, be in good academic standing with a cumulative GPA of 3.0 or higher (2.3 GPA for Law School) and have not been an ICT student at IU Indianapolis for more than 2 consecutive terms. Detailed information about ICT and how to apply can be found on the [Graduate School](#) webpage.

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Graduate Non-Degree and Accelerated Degree Programs

- Graduate Non-Degree (GND) Program
- Accelerated Bachelor's to Master's Programs

Application and admission to the Graduate Non-Degree (GND) Program

[The Graduate Non-Degree \(GND\) Program](#) is for individuals with at least a bachelor's degree, who wish to enroll in graduate courses only or a combination of graduate and undergraduate courses in the same semester. All Graduate Non-Degree students pay graduate tuition rates. Graduate courses in Medicine, Dentistry, Law, Business, Education, Nursing, and Social Work are typically not available to GND students. Some schools/programs have their own non-degree programs: Accounting, Dental, Education, Herron, Informatics, Library Science, Nursing, Physician Leadership Course in Business Acumen, and Social Work Pre-Doc. Contact these programs directly for more information.

Since GND students are not eligible to take graduate courses in several graduate programs, before applying to any GND program, students need to contact the graduate department in which their interest lies to determine the best admission and course options. All GND applicants should [consult the online materials and use the online application](#).

For those who have a bachelor's degree and wish to enroll in undergraduate courses only, please complete the [undergraduate admissions visiting student application](#).

Students who are initially admitted as non-degree students, but who later wish to obtain a graduate degree, must make formal application for admission to a departmental degree program. Once admitted, the department may recommend to the dean of the Graduate School that credit earned as a non-degree student be applied to degree requirements. No more than 12 credits earned as a GND student may be transferred at the discretion of the academic program. Students should be aware that certain departments and schools specifically prohibit course work taken under non-degree status from counting toward a degree after a student has been admitted to a degree program (Medicine, Dentistry, Law, Business, Education, Nursing, and Social Work).

A Graduate Nondegree student may enroll in more than 12 total credit hours total with prior approval of the Graduate School. If a student would like to enroll in more than 12 credit hours, they must submit an attestation acknowledging that no more than 12 credit hours may be applied toward degree requirements. Graduate Nondegree credit may not be combined with transfer credit to exceed transfer credit limits. The combined total of Graduate Nondegree and transfer credit that may be applied toward a degree is limited to a maximum of 12 credit hours for a master's degree and 30 credit hours for a doctoral degree.

Application and admission to Accelerated Bachelor's to Master's Programs

Accelerated bachelor's to master's degree programs allow IU Indianapolis undergraduate students to double count 9-12 graduate course credits towards both a bachelor's

and a master's degree. This accelerated track saves students both time and money

Students should first inquire with their school about the accelerated program and complete the internal application/declaration no later than their third year of undergraduate study. If admitted, students will be classified as an undergraduate with Accelerated Status until earning their bachelor's degree. Students should apply to the master's degree in the fall of their fourth year for the admit term AFTER their undergraduate degree is to be awarded; in this case the fall of the fifth year. If admitted to the master's degree, the student's classification will change to Graduate Status.

Frequent advising and a minimum 3.0 GPA is required for entrance into our IU Graduate School programs at IU Indianapolis. Students should check individual program websites for program-specific credit hour policies and degree requirements.

1. Once admitted to the accelerated track, undergraduate students may take dual credit hours of graduate credit during their fourth year as currently approved.
2. Students must discuss coursework options with the graduate program director and undergraduate advisor to ensure coursework will apply to both the bachelor's and master's degree before enrolling in classes. There are limits to the credits that can be double counted.
3. Before the master's degrees can be conferred, the academic graduate program must validate/verify that all degree requirements have been met. The undergraduate degree must have been awarded as a requirement for the master's degree award.

For more information visit the [IU Indianapolis Graduate School website](#).

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Professional Programs

IU Indianapolis offers professional degrees in [Dentistry](#) (D.D.S.), [Law](#) (J.D.), [Medicine](#) (M.D.), [Master of Physician Assistant Studies](#) (M.P.A.S.), [Master of Social Work](#) (M.S.W.), [Master of Science in Nursing](#) (M.S.N.), [Doctor Nursing Practice](#) (DPN), [Occupational Therapy](#) (O.T.D.), [Physical Therapy](#) (D.P.T.), [Master's of Business Administration](#) (MBA) [Master's of Public Health](#) (MPH), [Master's of Public Affairs](#) (MPA). and many other professional degrees and certificates.

Research, Fellowships, and Assistantships

Campus Fellowship opportunities can be found on the [Graduate School's Financial Support](#) website. Fellowship opportunities exist primarily for students pursuing traditional research-based graduate degrees. Contact your program if you wish to be considered for nomination. Individual schools and departments may also have information on research and teaching assistantships. [Handshake](#) may serve as an additional resource for assistantship and employment opportunities.

IU Indianapolis and IUSM offer many excellent research and internship programs for graduate and medical

students. Opportunities may be found on the IU School of Medicine's [Student Research Programs](#) website

Aid for Graduate and Professional Students

Individual departments and schools may have financial support available to graduate students in their programs. Graduate and professional students should consider filing the [Free Application for Federal Student Aid \(FAFSA\)](#) or a renewal FAFSA to apply for financial aid by the priority deadline April 15. The FAFSA is often used by IU Indianapolis schools in determining financial support eligibility. There are also [government loan options](#).

This support could be tuition remission, Graduate Fellowships, or a Student Academic Appointment (SAA). Sources of funding include school funds allocated for financial aid; internal or external grants; Indiana University merit-based fellowships; IU Indianapolis Graduate School fellowships; IU foundation funds; and state and/or federal financial aid. Student Academic Appointments are handled by the individual programs, not the Graduate School. Contact your graduate program for details.

Graduate Fellowships - offered by departments, schools, or the University to selected graduate students. The stipends attached do not require specific duties and may be excludable from taxable income to the extent they are used to pay for tuition and course-related books and expenses. More information may be found on the [Graduate School website](#). All fellowship recipients must be degree-seeking and enrolled full-time. A full-time course load is defined by each school but may not be less than 8 credit hours per semester as determined by the Registrar without special permission.

Student Academic Appointment - (Graduate Assistant, Research Assistant, Teaching Assistant) – offered by academic schools or departments to selected graduate students. The stipends attached to appointments are considered graduate student support and compensation for the academic duties assigned, and as such are considered taxable income. For Student Academic Appointees, full-time course load is 6 credit hours per semester as determined by the Registrar.

Visit the [Office of Financial Aid & Scholarships](#) and the [IU Indianapolis Graduate School](#) for more information on financial aid for graduate students.

Policies & Procedures

This section provides an overview of the academic regulations and procedures of the Indianapolis Graduate School and Indiana University.

- Academic integrity
- Graduate credit
- Degree conferral
- Full-time study
- G901 - advanced research
- Grading policies
- Research skills
- Leave of absence
- Residence requirements
- Revalidation of courses

- Transfer from one department to another

Graduate Credit

Graduate Course Numbering

Only courses listed in this bulletin or specifically allowed by it may be counted toward the requirements for a degree offered by the Graduate School. These courses are ordinarily numbered at the 500 level or above to reflect work expected in a graduate level course. Only courses listed in this bulletin or specifically allowed by it may be counted toward the requirements for a degree offered by the University Graduate School. These courses shall be numbered at the 500 level or above to reflect work expected in a graduate-level course.

Course Availability and Abbreviations

Not all courses listed in this bulletin are offered every year. Inquiries concerning the availability or suitability of a particular course should be directed to the appropriate departmental chairperson.

The number of hours of credit given in a course is indicated in parentheses following the course title. The abbreviation "P" refers to one or more course prerequisites. Similarly, the abbreviation "R" indicates recommended prerequisites. Courses eligible for a deferred grade are marked by the sign "***".

Credit Overlap Between Degrees

Courses taken while an undergraduate and counted toward the requirements of a baccalaureate degree may not also be counted toward a graduate degree except as part of an accelerated degree program.

With only two exceptions, courses counted toward the requirements for one advanced degree may not be counted toward requirements for another degree at the same level:

1. In the case of the M.F.A., course work completed as part of an M.A., M.S., or M.A.T. degree may, with the approval of the student's department, be counted toward the M.F.A., provided it otherwise meets the conditions stated in this bulletin.
2. In the case of the Dual Master's Program, certain reductions are allowed in the total number of hours required than if the two degrees had been taken separately. The Dual Master's Program involves two degrees at the master's level; the degrees may be under the jurisdiction of the Graduate School or of another Indiana University school. For further information, see "Dual Master's Program" under the master's degree requirements.

Work counted toward a master's degree may also be counted toward the Ph.D. if it has been approved by the student's advisory committee and if it otherwise meets the conditions stated in this bulletin, including the rules governing the transfer of credit from other institutions.

Transfer of Credit

Upon recommendation of the department and with the approval of the dean of the Graduate School, work taken for graduate credit at other institutions may be transferred in partial fulfillment of degree requirements. All courses requested for transfer must be from an accredited

institution, taken at the graduate level, and have a grade of B or higher. The following restrictions apply:

1. Candidates for the M.A., M.S., LL.M., or M.A.T. degree may transfer up to 9 hours of graduate credit from other institutions.
2. Candidates for the M.A.T. degree who are graduates of Indiana University may transfer up to 12 hours of graduate credit from other institutions.
3. Candidates for the M.F.A. degree may transfer up to 20 hours of graduate credit from other institutions.
4. Candidates for the Ph.D. degree may transfer up to 30 hours of graduate credit from other institutions.

It must be emphasized that the transfer of credit from other institutions is not an automatic occurrence. Students must obtain the written consent of both their departmental advisor and the Graduate School dean before credit earned at other institutions will be added to their records. Additionally, the utilization of a transferred credit, either from Indiana University or another institution, must be approved by the department and the Graduate School dean before it will be applied to the student's plan of study. If transfer credits are being applied with Graduate Nondegree credits, the listed limits above still apply.

Grading Policies

Grading Scale

Grade points are assigned at Indiana University according to the following scale, and grade point averages are computed taking into account any plus or minus which accompanies a letter grade.

A	=	4.0
A-	=	3.7
B+	=	3.3
B	=	3.0
B-	=	2.7
C+	=	2.3
C	=	2.0
C-	=	1.7
D+	=	1.3
D	=	1.0
D-	=	0.7
F	=	0

Satisfactory Grades

Ordinarily a minimum of a B (3.0) average in graduate work is required for continuance in graduate study and for all graduate degrees. Courses completed with grades below C (2.0) are not counted toward degree requirements, but such grades will be counted in calculating a student's grade point average. Some departments may require an average grade in graduate courses higher than B (3.0), while others may not count courses completed with grades below B (3.0) toward degree requirements (see departmental entries). No work may be transferred from another institution unless the grade is a B (3.0) or higher.

The dean of the Graduate School may review a grade record at any time and may place a student on academic probation if the record justifies such action. When the grade point average of a student falls below 3.0 or the student is not making sufficient progress toward the degree, the dean of the Graduate School will notify the student that they have been placed on probation. Unless

the student brings this record up to a 3.0 grade point average or begins making satisfactory progress in the next semester of enrollment, the student will not ordinarily be allowed to continue in the Graduate School.

Incomplete Grades

The grade of Incomplete "I" may be assigned to a student who, in the judgment of the instructor, has performed at a satisfactory level during a majority of the course but has not completed all the required work by the end of the term due to hardship or other good cause that the instructor deems would make it unjust to penalize that student for not completing the required work on time.

1. The instructor will inform the student of the missing course requirements and the assignments to be completed, and set a deadline for their completion, which may not exceed one year from the end of the term in which the course was taken. During this time, the student may not re-enroll in the course.
2. A student whose request for an Incomplete has been refused by the instructor may appeal to the [principal administrator](#) of the unit offering the course, who may approve or deny the request after consulting with the instructor about the reasons for the refusal.
3. At the end of the period allowed, the instructor will update the "I" with a final grade.
4. If no final grade has been submitted within one year from the end of the term in which the course was taken, and the student has not been allowed to withdraw, the campus registrar shall change the "I" to an "F."
5. Each academic unit shall develop a procedure for maintaining a record of incomplete grades that includes the reasons it was assigned, the deadline for removing it, and a guide for its removal in the event of the absence of the instructor from the campus.
6. If the instructor, in consultation with the principal administrator of the unit offering the course, determines that it is not feasible for the student to complete the required work, the student may be given a P or other letter grade based on the work completed, or allowed to withdraw from the course if no grade is feasible.

If an extension of the Incomplete grade past the initial one-year period is needed, instructors should select 'extension of incomplete' in the eGrade change drop down list. Upon approval by the University Registrar, this will prevent the automatic change to an F.

These regulations do not apply to research and reading courses in which completion of the course work is not usually required at the end of the semester. Incomplete work in those courses will be denoted by R (deferred grade).

Withdrawal from Course Work

Withdrawals prior to the "last day to drop a course with an automatic W" (see official calendar for each semester) are automatically marked W. According to university regulations, withdrawal after this date is permitted only with the approval of the dean of the student's school for urgent reasons related to the student's health or equivalent distress. In all such cases, the student must

submit a request for late withdrawal to the advisor or to the departmental chairperson. This request must be supported by the instructor of the course, the graduate advisor, and the departmental chairperson and then be forwarded to the dean with an accompanying statement outlining the reasons for the request. If the dean approves the request, the student's mark in the course shall be W if the work completed up to the point of withdrawal is passing; otherwise a grade of F shall be recorded. Failure to complete a course without an authorized withdrawal will result in the grade of F.

Pass/Fail Option

[Refer to IU policy.](#)

Full-Time Study

Ordinarily, students shall be considered full time if they are registered for 8 hours of credit (fall, spring, and summer terms) and their programs of study meet with the approval of the departments. Courses taken as an auditor may not be counted in the definition of "full-time study"; however, courses taken to remove undergraduate deficiencies for admission may be counted. Students holding appointments as associate instructors, graduate assistants, or research assistants must ordinarily be registered for 6 credit hours during each full semester.

For academic purposes, the Graduate School will consider as full-time certain students who are exceptions to the above definitions:

- M.A. and M.S. candidates whose completed courses and deferred thesis credits total 30 hours
- M.F.A. candidates whose completed courses and deferred thesis credits total 60 hours
- Ph.D. students whose completed courses and deferred dissertation credits total 90 hours, providing they are working on dissertations for the completion of the degree

Such students, however, must enroll in at least one hour of graduate thesis (for master's students) or dissertation (for doctoral students) credit each semester.

For master's candidates, such enrollment will be limited to the five-year period allowed for completion of the master's degree; this enrollment for doctoral candidates will be limited to the seven-year period after passing the qualifying examination.

Students who have already accumulated 90 or more hours of graduate credit and who hold university-administered student appointments as associate instructors, graduate assistants, or research assistants amounting to at least 0.375 FTE (15 hours per week workload) will be required to enroll in at least 6 hours of credit during each semester they continue to hold an appointment. Such hours will be charged at the allocated fee rate.

Students may take no more than 16 hours of credit in any semester or more than a total of 16 credit hours in all the summer sessions in any one year without permission of their graduate advisor. Students who are employed are advised to take into account the demands that such activities make on their time and to reduce their course loads accordingly.

Residence Requirements

All candidates for graduate degrees (with the exceptions outlined below) must complete at least 30 credit hours of graduate work while enrolled on campuses of Indiana University.

- Of these hours at least one semester or two summer sessions of full-time work must be taken in Graduate School degree-granting units on the Bloomington, Indianapolis, South Bend, or Southeast campuses.

Candidates for the Ph.D. degree must spend at least two consecutive semesters during one academic year enrolled in coursework on the Indianapolis campus.

Work Done at More Than One Indiana University Campus

Students who plan to earn a degree through a degree-granting unit on one Indiana University campus and who plan to take a substantial number of hours on one or more of the other Indiana University campuses in partial fulfillment of degree requirements should have their programs of study approved in advance by the degree-granting unit. The residency requirement must be met on the campus where the degree-granting unit is located.

Research Skills

Courses taken to fulfill research-skill requirements may, at the discretion of the student's major department, be counted for graduate credit in a student's program of study provided such courses are listed in this bulletin as carrying graduate credit. Each course must be passed with a grade of B (3.0) or higher.

Academic Integrity

Students are expected to adhere to the highest ethical standards in all their course work and research. Individuals violating that code of conduct are subject to disciplinary action; such breaches could lead to expulsion of the student from Indiana University or to rescission of a degree already granted. Students should also refer to Indiana University's .

Academic misconduct is any activity that tends to undermine the academic integrity of the institution. It may include, but is not limited to human, hard-copy, or electronic resources, cheating, fabrication, plagiarism, interference, violation of course rules, and facilitating academic misconduct.

Research Integrity and Responsible Conduct of Research

Graduate students engaged in research, scholarship, and creative activity are expected to conduct their work with honesty, accuracy, objectivity, and accountability. Research integrity includes adherence to ethical and professional standards related to the responsible conduct of research, including but not limited to data acquisition, management, sharing, and ownership; authorship and publication practices; peer review; conflicts of interest; collaborative research; mentoring relationships; and the protection of human and animal subjects. Students are expected to comply with all applicable university policies, sponsor requirements, and regulatory standards governing research and scholarly activity.

The student's research committee is responsible for evaluating whether the academic standards set by the *Code of Student Rights, Responsibilities, and Conduct* are upheld in the student's project, thesis or dissertation. Faculty are encouraged to utilize services provided by the [Indianapolis Center for Teaching and Learning](#) to aid in assessing student research.

Transfer from One Department to Another

Matriculated students wishing to transfer from one department within the Graduate School to another should first consult their graduate advisors or advisory committees and the graduate advisor of the new department about the wisdom of the change. International students desiring to make such a change must also obtain the approval of the Office of International Affairs.

Revalidation of Courses

Normally, a course may not be counted toward degree requirements if it has been completed more than:

- Five years prior to the awarding of the degree for master's students
- Seven years prior to the passing of the qualifying examination for Ph.D. students

The graduate advisor, after consultation with the advisory committee, may, however, recommend to the dean of the Graduate School that course work taken prior to the above deadlines be revalidated if it can be demonstrated that the knowledge contained in the course(s) remains current. Currency of knowledge may be demonstrated by such things as:

- Passing an examination specifically on the material covered by the course
- Passing a more advanced course in the same subject area
- Passing a comprehensive examination in which the student demonstrates substantial knowledge of the content of the course; if the qualifying examination is used for the purpose of revalidation, the number of courses to be revalidated by this method should be limited to two in order to avoid compromising the integrity of the qualifying examination process.
- Teaching a comparable course
- Publishing scholarly research demonstrating substantial knowledge of the content and fundamental principles of the course
- Documented professional experience

Each course for which consideration for revalidation is being requested should be justified separately.

Leave of Absence

Though timely academic progress is essential to all programs of study, students will occasionally encounter extenuating circumstances that affect their ability to make adequate progress, and which may necessitate a leave of absence.

All schools must establish and maintain school-level leave policies for students enrolled in graduate degree programs. Graduate student leave policies must be clearly communicated and accessible to all students and, in

general, should address all procedural, academic, and financial considerations.

The Graduate School will likewise provide exceptions and/or increased flexibility with regards to academic progression to all students approved for a leave of absence by their respective schools.

G901 - Advanced Research

To keep their candidacies active, doctoral students with 90 credit hours or more and Master of Fine Arts students with 60 credit hours or more may enroll in G901 for a flat fee of \$150. Eligible students must have completed all graduate degree requirements except for the dissertation or final project/performance. Enrollment in G901 is limited to six times. Students who do not meet these criteria pay the applicable credit hour rate for dissertation research.

Degree Conferral

The Graduate School will recommend the candidate to the Board of Trustees for the degree only upon completion of all the requirements stated in this Bulletin. Degrees are awarded on the last day of each month of the year with the exception of May, August, and December. For the degree conferral schedule, please consult the Registrar's Office.

Master's Degree Conferral

For all students seeking a master's degree, an application for the degree must be filed with the Graduate School at least 30 days before the date anticipated for degree conferral. All degree requirements must be completed at least 30 days before the date of expected degree conferral, including submission to the Indianapolis Graduate School of the master's thesis (if required for degree). Electronic submissions are preferred.

Ph.D. Conferral

Submission of the Dissertation Doctoral students apply for conferral of the Ph.D. degree by submitting the completed and accepted dissertation and abstract to the Graduate School as described in the *Submitting Accepted Dissertations* section. Doctoral students are reminded:

1. They must submit the defense announcement form 30-days prior to the defense of the dissertation.
2. Research committees frequently require revisions and corrections after the defense of the dissertation. These revisions must be made before the dissertation is ready for submission to the Graduate School.

Commencement

All graduate students are encouraged to participate in the Commencement ceremonies. The solemn yet colorful academic pageantry can provide a fitting culmination to a period of intense study and work. All Ph.D. candidates are hooded by their professors. Procedures for participating in Commencement may be obtained by contacting the Graduate School.

General Requirements for Advanced Degrees

Guidelines for Requirements

Graduate Certificates

Master's Degree

Ph.D Degrees

The following statements regarding degree requirements outline the minima that are acceptable. The student must meet not only the general requirements of the Indianapolis Graduate School but also the specific requirements of the individual department(s). See the "IU Indianapolis Schools" entries for departmental requirements.

Requirements are given in this bulletin only for degrees awarded by the Indianapolis Graduate School. Professional graduate degrees are also available at Indiana University. These professional degrees are administered by the respective schools; information regarding these degrees and the requirements for each may be found in the bulletins of the individual schools.

Students intending to continue their graduate studies toward a Ph.D. are encouraged to complete a traditional master's degree program that requires a thesis.

About the Requirements for Master's Degrees

Master's Degrees offered at IU Indianapolis

Assignment to an Advisory Committee

Preparing and Submitting Theses

The number of credit hours required by the Indianapolis Graduate School for master's degrees varies according to the individual degree (see each section for details). However, with the exception of the Dual Master's Program, the requirements for all master's degrees must be completed within five consecutive years.

If the master's degree is used to meet part of the requirements to convert a provisional or standard teaching certificate into a professional certificate (which is no longer a life license), the student's degree program must include at least 18 credit hours of graduate work in the major or minor field or both.

With the exception of the Master of Arts for Teachers (M.A.T.), a thesis or reading knowledge of a foreign language is normally required for a master's degree (see departmental entries for exceptions). If a thesis is not required, departments are encouraged to substitute some other type of special project that is creative, exploratory, or experimental in nature. In lieu of the traditional thesis, for example, the department might require seminar papers, presentations, publishable reports, artistic performances, or exhibitions.

The thesis or alternative project should be equivalent to no fewer than 3 nor more than 9 hours of graduate credit; such credit should be granted under an appropriate departmental course or independent study number. Departures from traditional thesis requirements prescribed by the individual departments must be approved by both the department and the dean.

Master's Degree Types and Requirements

Master of Arts

Thirty (30) credit hours are required for the M.A. (some departments require more than 30), all of which may be taken in a single department; at least 20 of these credit hours must be earned in the major field. A minimum of 9 credit hours of course work or at least three courses in the major field (excluding thesis) must be numbered 500 or above.

Master of Science

General requirements for the M.S. are identical with those for the M.A. (see above) with a few exceptions:

- Students in the combined M.S./M.D. program have seven years in which to complete requirements for the M.S. degree
- Students in the M.S. program in Geology at Indianapolis have six years in which to complete requirements for the M.S. degree

Master of Fine Arts

The M.F.A. degree, which is offered by the School of Art, Architecture, + Design, and the Departments of English and Theatre, Drama, and Contemporary Dance, requires a minimum of 60 credit hours.

Master of Arts for Teachers

In order to be admitted to this program, students must hold a baccalaureate degree from a regionally accredited institution. The degree should include sufficient hours in each discipline in which students plan to work to enable them to elect courses carrying graduate credit (see departmental entries for details).

Thirty-six (36) credit hours beyond the baccalaureate degree are required, at least 20 of which must be in the major teaching field, with the remainder allocated either to additional work in the major or to one or more minors. Certain interdepartmental programs have specific minor requirements (for details, see the individual program statements).

Each candidate must possess a teacher's certificate (from Indiana or another state in the United States) at the time the degree is conferred, with the exception of international students, who must be certified by their departments. Because in some cases licensing requirements and M.A.T. course requirements may overlap, the teaching certificate will be issued and the degree will be conferred at the same time. Graduates who do not hold certificates (teaching licenses) should have their credentials evaluated for teaching certification purposes by the graduate licensing advisor in the School of Education.

Upon recommendation of the department and approval by the dean of the graduate school, a maximum of 6 credit hours of undergraduate courses taken after completion of the baccalaureate degree may be applied toward the M.A.T. degree. M.A.T. degrees are available in most areas represented in the high school curriculum. Interested students should consult the chairperson of the department or the division concerned to discuss programs of study.

Dual Master's Program

Students who are concurrently enrolled in two departments may qualify for two master's degrees under a provision that allows credit earned to satisfy the major requirements of one department to count as elective credit in a second department. Dual master's degrees require a minimum of 50 credits, with at least 21 credits earned in each of the programs.

To be eligible for this program, a student must be formally admitted by both departments and by the Indianapolis Graduate School. All requirements of both degrees must be met, including passing any departmental examinations and satisfying foreign-language/research-skill requirements.

If both departments require a thesis, the student may write a single thesis that meets the requirements of both fields. The thesis committee will comprise an equal number of representatives of both departments, and the thesis credit will be split between the two. All course work for the program must be completed within a period of six years.

Assignment to an Advisory Committee

Three or more faculty members should participate in certification of the student's fulfillment of the requirements for a master's degree. Their participation may take any of several forms, such as administering a final or comprehensive examination, or evaluating the candidate's thesis or alternative project. In instances where shortcomings are apparent, the student may be required to complete additional course work or assignments.

Preparing and Submitting Theses

Composition Guidelines

Theses must be typed with the body of the text double-spaced and with one-inch margins on all sides. Theses must be written in English unless you and your department/committee have decided otherwise.

Page numbers must be consecutive throughout, with Arabic numerals used for the body of the work and small or lowercase Roman numerals for the front matter. Script fonts (ex. Monotype Corsica) and italicizing large sections of text are not allowed for the main body of your text, although italics may be used appropriately.

Thesis Approval and Submission

The title page must bear the statement: "Submitted to the faculty of the Indianapolis Graduate School in partial fulfillment of the requirements for the degree Master of _____ in the Department of _____, Indiana University."

At least three members of the faculty shall normally participate in the approval of the thesis and must sign an acceptance page which appears after the title page. The statement, "Accepted by the faculty of the Indianapolis Graduate School, Indiana University, in partial fulfillment of the requirements for the degree Master of _____," should precede the signatures on the acceptance page. Each copy of the thesis is to be accompanied by the student's vita sheet inserted at the end.

Should the student wish to submit the thesis as an unbound paper copy rather than electronically for review by the University Graduate School, they should contact the University Graduate School recorders.

For more information, see [Theses and Dissertations](#) on the Indianapolis Graduate School website.

Ph.D. Degree

- Major Subject and Minor Subjects
- Double Majoring
- Combined Degree Programs
- Assignment to an Advisory Committee
- Maintaining Academic Progress
- Qualifying Examinations
- Admission to Candidacy
- Continuing Enrollment
- Dissertation Research Committee
- Preparing Dissertations
- Dissertation Defense
- Submitting Accepted Dissertations

The Ph.D. degree requires completion of at least 90 credit hours of an advanced course of study. The degree is awarded in recognition of a candidate's command of a broad field of knowledge and accomplishment in that field through an original contribution of meaningful knowledge and ideas.

Major Subject and Minor Subjects

Major Subject

The student will select a major subject from the departments and programs listed in this bulletin. The major department or program is responsible for monitoring the student's progress toward the degree and for making recommendations to the Indianapolis Graduate School regarding the nomination to candidacy, the appointment of a research committee, the defense of the dissertation, and the conferring of the degree.

Minor Subject

The student will select at least one minor subject. A minor is meant to provide additional breadth and to complement and enhance the value of the major. The minor must be distinct from the major – courses counted toward a minor cannot also be counted toward the major, and the courses must be taken outside the major discipline from among the specifically approved minors listed in this bulletin.

Courses counted toward a minor cannot also be counted toward the major. The determination of the minimum requirements and examination procedure (if any) for the minor is entirely at the discretion of the minor department or program.

Individualized Minor

In certain cases, special individualized minors (12 or more credit hours of work in two or more programs) or minors not specifically listed in this bulletin may be approved by the dean of the graduate school upon recommendation of the student's advisory committee, provided such approval is requested prior to pursuit of any of the proposed courses of study. Examination procedures (if any) or other requirements (for example, stipulation of

the minimum grades acceptable) should also be specified in the proposal to the dean.

Double Majoring

Students may pursue two majors in two departments simultaneously if so recommended by each department and approved by the dean of the graduate school. Two general requirements pertain to double majors:

1. There must be a substantive relationship between the two major fields, particularly with respect to the topic of the student's dissertation
2. All degree requirements for each major must be fulfilled, including the passing of two sets of qualifying examinations.

Double Major Requirements

A total of 90 credit hours is required for the Ph.D. degree with a double major. While judicious program planning may permit completion of some double majors within the 90 credit hours, other students may accrue additional hours due to the programs of study required for each major. In recognition of such a possibility, students in the program will be allowed one additional year, for a total of eight years, before they must take the qualifying examinations.

In some instances it may be possible to count the same work toward requirements in both departments (e.g., a specific foreign language acceptable in both programs). The exact courses of study and examinations required are to be determined by members of the research committee from each of the majors. Any area of substantial overlap in the two courses of study or in the examinations is to be negotiated by the committee as a whole and approved by the dean of the graduate school.

Double Major Advisory and Research Committees

There must be at least four faculty members on both the advisory and research committees for a double major, with two from each of the majors. Additionally, the research committee must have two chairs (co-chairs), one from each of the majors. If other minor fields are involved, a representative must also be present from each of these.

A link to the complete set of rules relating to double majors and the appropriate form for applying for a double major can be found on the Indianapolis Graduate School [Forms](#) page.

Combined Degree Programs

The School of Medicine, School of Dentistry, McKinney School of Law, and the Indianapolis Graduate School offer selected students an opportunity to pursue the M.S. or Ph.D. degrees, concurrently or sequentially, with a coordinated and flexible program leading also to the M.D., D.D.S., or J.D. degree. Combined degree programs are available in anatomy, biochemistry, dental science, medical biophysics, medical genetics, medical neurobiology, microbiology and immunology, pathology, pharmacology, and physiology. The combined degree program is designed to meet the student's particular objectives and needs and is planned by the student and an advisory committee of faculty representing the School of Medicine, the McKinney School of Law, or the School of Dentistry and the respective department or program.

Combined Degree Admission

Entry into a combined degree program requires approval of the Indianapolis Graduate School and the relevant school (the School of Medicine, the School of Dentistry, the McKinney School of Law). Two applications are necessary: one to the Indiana University School of Medicine, School of Dentistry, or McKinney School of Law, and another to the Indiana University Graduate School via the sponsoring department or program.

Combined Degree Requirements

Completion of the program entails meeting all requirements for both degrees.

Many nonclinical courses of the curriculum of the School of Medicine satisfy course requirements for both degrees, and credit given for graduate study may fulfill some of the School of Medicine requirements. The combined degrees may thus be acquired in less time than would be required if both were taken separately. As well as fulfilling requirements for the M.D. program, a minimum of 30 credit hours of graduate study is required for the combined M.S./M.D. degree. Of these, 10 credit hours may be transferred from exclusively School of Medicine courses with the approval of the student's advisory committee and the Indianapolis Graduate School. Similarly, a minimum of 90 credit hours of graduate study is required for the combined Ph.D./M.D. degree. A maximum of 30 credit hours of exclusively School of Medicine courses may count toward the Ph.D. degree.

Indiana Medical Scientist Program

The Indiana University School of Medicine has established an Indiana Medical Scientist Program for fellowship and tuition support of students in the combined M.D./Ph.D. program. A faculty committee nominates students for the program based on commitment to a career as a physician scientist, research experience, undergraduate grade point average, and MCAT scores. A flexible entry program allows students up to one year to identify a research laboratory and degree program. Information can be obtained from the Graduate Division of the School of Medicine.

Advisory Committee

The student's major department or program shall assign the student to an advisory committee no later than one year after admission to the Ph.D. program. The advisory committee must include:

- At least two members from the major area
- One member from an area outside the major
- At least two of the above members must be members of the graduate faculty

The names of faculty members nominated to serve on the advisory committee shall be forwarded to the student's school or college for approval no later than one year after the student has been admitted to the Ph.D. program. The advisory committee shall approve the students' program of study and counsel the student until the passing of the qualifying examination.

Maintaining Academic Progress

The policy of the Graduate Faculty is that students may be dismissed for failure to maintain adequate academic

progress toward the degree. For candidates, this standard is set by the faculty of each program or by the student's dissertation committee.

The student must first be notified of deficient academic progress by being placed on probation for one semester. If the deficiency is not rectified then the student may be dismissed.

Qualifying Examinations

This examination, given at such time and in such manner as the major department shall determine, shall be written, although additional oral examinations may be required. The qualifying examination shall cover the major subjects and may, at the discretion of the minor department(s) or the interdepartmental committee, cover the minor subjects as well.

Completion of Degree Requirements

Normally, the qualifying examination is taken after the student has completed all course work for the Ph.D. All such work offered in partial fulfillment of degree requirements must either have been completed within seven consecutive calendar years of the passing of the qualifying examination or be revalidated according to procedures outlined in this bulletin (see "Revalidation of Courses"). For students in combined M.D./Ph.D. programs, all course work offered in partial fulfillment of degree requirements of the Ph.D. must have been completed within nine consecutive calendar years preceding the passing of the qualifying examination; for students in Ph.D. programs in music, within 10 consecutive years.

Reading proficiency required in one or more foreign languages must also have been demonstrated, whether by course work or examination, no more than seven years before the passing of the qualifying examination.

Passing the Qualifying Examination

In the case of an examination of more than one part, the date of passing is regarded as the date of passing the final portion of the examination, typically the oral examination. Students who fail the qualifying examination are normally allowed to retake it only once. The qualifying examination must be passed at least eight months before the date the degree is awarded. Some programs may have deadlines which are earlier than those of the Indianapolis Graduate School; therefore, students should consult with their program office.

Admission to Candidacy

Following the passing of the qualifying examination and the completion of all course work and departmental language or research-skill requirements (if any), the student's advisory committee will submit a [Nomination to Candidacy Form](#) to the Indianapolis Graduate School. Upon approval of the dean of the graduate school, the student will be admitted to candidacy. By request, students can be provided a certificate of candidacy.

The date of successful completion of the qualifying examination (not the date of final approval of candidacy) is the one used in determining the seven-year periods for currency of courses (see "Qualifying Examination")

and completion of the dissertation (see Submission of the Dissertation).

The policy of the Graduate Faculty is that students may be dismissed for failure to maintain adequate academic progress toward the degree. For candidates, this standard is set by the faculty of each program or by the student's dissertation committee. The student must first be notified of deficient academic progress by being placed on probation for one semester. If the deficiency is not rectified, the student may be dismissed.

Reinstatement to Candidacy

Any student whose candidacy lapses will be required to apply to the Indianapolis Graduate School for reinstatement before further work toward the degree may be done formally. To be reinstated to candidacy in the Indianapolis Graduate School, the student must:

1. Obtain the permission of the departmental chairperson
2. Fulfill the departmental requirements in effect at the time of the application for reinstatement
3. Pass the current Ph.D. qualifying examination or its equivalent (the department must define in advance specifically what is meant if an "equivalent" examination is to be used, and that definition must be approved by the dean)
4. Request reinstatement to candidacy from the dean.

Such reinstatement, if granted, will be valid for a period of three years, during which time the candidate must enroll each semester for a minimum of one credit (not including summer terms except when the student is graduating during the summer).

Continuing Enrollment

Students who have passed the qualifying examination must enroll each semester (excluding summer sessions) for any remaining required course work or dissertation credits. Once such students have accumulated 90 credit hours in completed course work and deferred dissertation credits, they must enroll for a minimum of 1 hour of graduate credit each semester until the degree is completed. Students holding appointments as associate instructors, graduate assistants, or research assistants must ordinarily be registered for 6 credit hours during each full semester. Failure to meet this requirement will automatically terminate the student's enrollment in the degree program.

Students who have completed 90 credit hours and all requirements for the Ph.D. are eligible to enroll in G901 for a flat fee of \$150 per semester. Enrollment in G901 is limited to a total of six semesters. These hours do not count toward the required 90 credit hours of course work. See "G901 - Advanced Research" for more information.

A candidate who will be graduated in June, July, or August of any year must enroll in a minimum of 1 hour of credit during the summer semester as described above.

Preparing Dissertations

The culmination of the Ph.D. program is the writing of the dissertation, which is required of all doctoral students. The dissertation must be an original contribution to knowledge and of high scholarly merit. The candidate's research must reveal critical ability and powers of imagination and

synthesis. The dissertation is written under the supervision of a research director and a research committee, as described in the section "Research Committee."

Although work published by the student may be incorporated into the dissertation, a collection of unrelated published papers, alone, is not acceptable. There must be a logical connection between all components of the dissertation, and these must be integrated in a rational and coherent fashion. It is the responsibility of the student's research committee to determine the kind and amount of published materials which may be included in a dissertation.

Composition Guidelines

Dissertations must be typed with the body of the text double-spaced. Dissertations must be written in English unless you and your department/committee have decided otherwise.

For dissertations that will be bound in paper form, margins must be at least one-and-a-half inches on the left and one inch on the top, right, and bottom. Students who submit their publications in electronic form only may choose to have one-inch margins on all sides.

Page numbers must be consecutive throughout, with Arabic numerals used for the body of the work and small or lowercase Roman numerals for the front matter. Script fonts (ex. Monotype Corsica) and italicizing large sections of text are not allowed for the main body of your text, although italics may be used appropriately.

The paper used for any bound copies must be watermarked, 100-percent cotton bond paper of 20 or 24 lbs., measuring 8 1/2 by 11 inches. If photographs or detailed graphics are part of the work, make certain they are crisp and clear when printed. It is acceptable to use special laser or photo paper for the page(s) in the dissertation containing images in order to achieve the best possible quality.

Dissertation Research Committee

Forming the Research Committee

To initiate research for the dissertation, the student chooses a professor who will agree to direct the dissertation. The department shall then recommend to the dean of the graduate school for approval a research committee composed of:

1. The chosen director (who will also normally serve as chairperson of the committee)
2. Two or more additional faculty members from the major department
3. A representative of each minor

The committee should be selected from the members of the graduate faculty who are best qualified to assist the student in conducting the research for the dissertation. The committee has the responsibility of supervising the research, reading the dissertation, and conducting the final examination.

- All members of a research committee must be members of the graduate faculty. At least half of

the members of the committee must be members of the graduate faculty with the endorsement to direct doctoral dissertations; others may be regular members.

- All chairpersons of research committees and directors of research must be members of the graduate faculty with the endorsement to direct doctoral dissertations. The endorsement is reserved for tenure-track faculty with a regular appointment at Indiana University and is granted separately from graduate faculty status. If, however, special expertise in an area is held by a member of the graduate faculty who does not have the endorsement, the departmental chairperson may request that the dean of the graduate school approve such an individual as research committee chairperson or director of the dissertation research.
- In the event that the dissertation research does not involve the area(s) of the minor(s) whether outside or inside the department the major department may request, with the consent of the minor-field representative(s), the substitution of a representative or of representatives from some other field(s) more appropriate to the topic of the dissertation.

Research Committee Approval

After consultation with and approval by the dissertation director and research committee, the student will submit to the Indianapolis Graduate School a one- or two-page prospectus of the dissertation research. If the proposed research involves human subjects, animals, biohazards, or radiation, approval from the appropriate university committee must also be obtained. The membership of the research committee and the dissertation prospectus must be approved by the Indianapolis Graduate School at least six months before the defense of the dissertation. Some programs may have deadlines which are earlier than those of the Indianapolis Graduate School; therefore, students should consult with their program office.

Dissertation Defense

Submitting the Dissertation to the Research Committee

When the dissertation has been completed, the student should submit an unbound copy to each member of the research committee as the initial step in scheduling the defense of the dissertation. All members of the research committee should read the dissertation in its entirety before attending the defense.

At this stage both the student and the faculty members must extend certain courtesies to each other. It is the responsibility of the student to give faculty members sufficient time to read the dissertation without making unreasonable requests of them based upon Indianapolis Graduate School time limitations, immediate job possibilities, contract renewal, or some other reason. Similarly, a faculty member should not keep a student's work for inordinate periods of time because of the press of other duties. Once a faculty member assumes membership on a research committee, it becomes another part of his or her teaching assignment, comparable to conducting regularly scheduled classes.

Readiness for Defense

After the committee members have read the dissertation, there should be direct communication (either in writing or orally) between the research committee chairperson and the other committee members about its readiness for defense. Readiness for defense, however, is not tantamount to acceptance of the dissertation; it means that the committee is ready to make a decision. The decision to hold a doctoral defense, moreover, is not entirely up to the research committee. If a student insists upon the right to a defense before the committee believes the dissertation is ready, that student does have the right to due process (i.e., to an oral defense) but exercises it at some risk.

If the decision to proceed with the defense of the dissertation is made against the judgment of one or more members of the committee, or if one or more members of the committee disapprove of parts of or all of the dissertation, the committee member(s) should not resign from the committee in order to avoid frustration or collegial confrontation. The Indianapolis Graduate School urges that such committee members, after ample communication with both the student and the chairperson, remain on the committee and thus prevent the nomination of a committee that might eventually accept what could be unsatisfactory work. Such a committee member could agree that a dissertation is ready for defense but should not be passed (or should not be passed without substantial modification). There will, of course, be situations in which the membership of research committees should or must be changed (e.g., turnover of faculty), but changes because of modifications in the dissertation topic or some equally plausible reason should be made early in the writing of the dissertation.

Scheduling and Conducting the Defense

Thirty days prior to the scheduled defense of the dissertation, the candidate must submit to the Indianapolis Graduate School a [Ph.D. Defense Announcement](#) via the electronic document (e-doc) system. (Some programs may have requirements which are earlier than those of the Indianapolis Graduate School; therefore, students should consult with their program office.) The announcement contains, among other things, a summary of the dissertation (not less than 150 words) which is informative and contains a brief statement of the principal results and conclusions. The announcement must be approved by the research committee chairperson. If the candidate has published any scholarly articles relevant to the topic of the dissertation, bibliographical references should be included in the summary. A copy of such announcements will be sent to any member of the graduate faculty upon request.

Once the final examination has been scheduled, the announced time and place of the defense must not be changed without the approval of the dean of the graduate school. Any member of the graduate faculty who wishes to attend the final examination is encouraged to do so; it is requested, however, that the faculty member notify the chairperson of the research committee in advance so that space can be arranged. With the approval of the research committee and the consent of the candidate, other graduate students may attend the defense of the dissertation; normally such students will act as observers, not as participants.

Defense Outcome

At the end of the oral examination, the research committee must vote on the outcome of the examination. Four options are available to the committee:

1. Pass
2. Conditional pass
3. Deferred decision
4. Failure

If the decision to pass is unanimous, the dissertation is approved once it is received by the Indianapolis Graduate School along with an acceptance page signed by the members of the research committee. If the decision is not unanimous, majority and minority reports should be submitted to the dean of the graduate school who, within 10 working days, will investigate and consult with the research committee. Upon completion of the graduate school dean's investigation and consultation, another meeting of the research committee will be held, and if a majority votes to pass, the dissertation is approved when it is received by the Indianapolis Graduate School with an acceptance page signed by a majority of the members of the research committee.

The student must have received acceptance of his or her dissertation and must submit a copy to the Indianapolis Graduate School within seven years after passing the qualifying examination. Failure to meet this requirement will result in the termination of candidacy and of the student's enrollment in the degree program. For information about candidacy reinstatement, see "Admission to Candidacy"

Submitting Accepted Dissertations

Following acceptance by the research committee, the dissertation is submitted to the Indianapolis Graduate School. Students are expected to submit the final version of the dissertation within six months of the defense date to maintain sufficient academic progress.

Title Page, Acceptance Page, and Abstract

Each dissertation must include a title page bearing the statement:

"Submitted to the faculty of the Graduate School in partial fulfillment of the requirements for the degree Doctor of Philosophy in the Department of _____, Indiana University."

(Note: Students majoring in programs will use "Program of;" students majoring in departments will use "Department of"; students majoring in schools will use "School of.") The date of this page should be the month and year when all requirements have been satisfied; this is not necessarily the month in which you defend.

Following the title page is the acceptance page with the statement:

"Accepted by the faculty of the Graduate School, Indiana University, in partial fulfillment of the requirements for the degree Doctor of Philosophy."

The acceptance page must be signed by members of the research committee. See the online guide on the Graduate School website for the complete order for the front matter.

The candidate must also submit an abstract of no more than 350 words for the dissertation that has been approved and signed by the research committee. The abstract will appear in ProQuest Dissertations & Thesis Database, managed by ProQuest Dissertation Publishing, Ann Arbor, Michigan. If the original abstract is not in English and an English translation has been made, submit both the English and non-English language abstracts.

Any creative work, such as a dissertation, is automatically copyrighted; however, registration with the U.S. Copyright Office provides (various/certain) legal benefits. The cost for registering a work through ProQuest is currently \$75. [Contact ProQuest for details.](#)

Electronic Submission

This is the preferred submission method. Once approved and finalized, the dissertation should be submitted electronically in the form of a .pdf file to ProQuest. A microfilm version will also be made available for purchase from ProQuest Dissertation Publishing by all those who request it. Effective September 27, 2010, there is no longer a fee for those dissertations submitted electronically and opting for Traditional Publishing. Open Access publishing has a fee of \$95.00.

Graduate Certificates

Area Certificates

A number of departments offer area certificate programs that students may complete through concurrent study. Such certificates can be pursued only in conjunction with a degree program and cannot be awarded independently. For further information, please see the departmental entries in this bulletin.

Stand-Alone Certificates

Graduate certificates are offered in some fields to allow a focused credential to be earned by a person who has already earned an undergraduate degree, whether or not the person is currently enrolled in an Indiana University master's or doctoral program. The courses taken are typically the same as those taken for other degrees, but a more limited number of courses is required for the certificate. Graduate certificates typically involve a predetermined curriculum of 16 to 20 credit hours.

Students enrolled in stand-alone certificate programs who wish to subsequently pursue an advanced degree must make separate application to the University Graduate School and must have specific permission of the faculty of their degree program to use any credits earned as a certificate student for the more advanced degree.

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Africana Studies

School of Liberal Arts

Departmental E-mail: ketienn@iu.edu or teamgrad@iu.edu

Departmental URL: <https://liberalarts.indianapolis.iu.edu/academics/degrees-programs/africana-studies/index.html>

Curriculum

Courses

Degrees Offered

Doctoral Minor in Africana Studies

Program Information

This Ph.D. minor is designed for graduate students across disciplines who want to incorporate the study of African and African descended experiences in Africa and the Americas into their academic or professional goals.

Graduate Minor Requirements

The Ph.D. Minor in Africana Studies requires 12 credit hours. Courses will be offered in a sequence of three core courses and one elective. An independent study option can also be counted as an elective but must be approved by the minor advisor. All courses must be passed with a grade of B or better.

Core Courses (9 cr.)

AFRO-A 515 Africana Critical Theories (3 cr.)

AFRO-A 537 Theorizing Feminisms: The Black Woman Cross-Culturally (3 cr.)

AFRO-A 569 Introduction to Africana Studies (3 cr.)

Electives selected from the following (3 cr.)

AFRO-A 503 Special Topics in Africana Studies (3 cr.)

AFRO-A 530 Exploring Global Black Arts Movements (3 cr.)

AFRO-A 531 Theories of Africana Thought (3 cr.)

AFRO-A 595 Independent Readings in Africana Studies (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

American Studies

School of Liberal Arts

Departmental email: haberski@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/programs/american-studies

Curriculum

Courses

Degrees Offered

Doctor of Philosophy in American Studies

Program Overview

The Ph.D. in American Studies at IU Indianapolis provides an academic infrastructure for a collaborative and applied graduate school experience that addresses contemporary problems through theories and methods from a variety of disciplines. The program provides skill sets by requiring students to take courses from varying faculty, in varying disciplines, that emphasize studies encompassing aspects of the US-based "American experience," broadly

defined. Students will also be expected to accumulate significant experience collaborating with organizations and institutions throughout the city and region. By mandating a related internship of at least one full year in such agencies, the program will promote the students' application of academic research outside of the academy. The program also will seek to expose students to the best available set of innovative and interdisciplinary mix of methods courses so as to provide them with the knowledge and skills required to thrive in related environments.

Student Learning Outcomes

- Demonstrate logical problem solving by integrating philosophical and scientific methods
- Summarize literature in a particular field or concentration
- Integrate philosophical and scientific methods in a research design
- Summarize and critique assumptions that prevail in the study of the United States and its institutions
- Analyze and compare different case studies
- Coordinate a project and interact with a team within a non-academic environment as part of an internship
- Produce a project design that integrates web-based material Contrast institutional differences between the United States and other countries through experiences made possible by study in international centers of American Studies
- Demonstrate applicability of project design
- Test and evaluate research project with a team of experts
- Defend and refine research project

Admission Requirements

Recruitment of candidates for this program will present opportunities that are somewhat atypical for doctoral programs in the liberal arts. Traditionally, doctoral programs attract students who wish to work with specific faculty members within specific disciplines to build expertise and future careers in that discipline. The program proposed here seeks to attract students who believe contemporary problems require understanding and analysis that a research degree anchored in the liberal arts provides. Rather than recruiting students to become future academics, this program uses academic training to develop expertise that can be applied primarily outside of classrooms. To that end, the recruitment of students will depend on establishing clear connections between external partners for internships, research centers at IU Indianapolis, and faculty who will mentor students by helping them build programs that prepare them for fields in which they will intern.

Candidates are not required to hold advanced degrees in any discipline, but this program will most likely attract students holding either a B.A. or M.A. in liberal arts disciplines or related degrees. Candidates should have a GPA of 3.5 or higher and, if holding only a bachelor's degree, are required to take the Graduate Record Examination (GRE) General Test (Quantitative, Verbal, and Analytical Writing). While we do not expect to institute a fixed minimum requirement, students shall be advised that successful candidates typically have scores above

the 70th percentile in the verbal, quantitative, and analytic writing sections.

For those applicants whose native language is not English, or who have not received a degree from an institution in a country where English is the official language, review Graduate School requirements. However, because of the importance of writing skills in a program with a dissertation requirement, applicants should typically score above the 70th percentile (i.e., 94 on the Internet-based TOEFL). Final decisions on admission shall be made by the American Studies Admissions Committee.

To be eligible for admission to the Ph.D. in American Studies at IU Indianapolis, you need to meet the following requirements:

1. Bachelor's degree from a regionally accredited institution
2. Minimum grade point average of 3.0 (B) overall from undergraduate studies
3. Submission of the [online application](#) to the campus
4. Provide a CV/Resume
5. Personal Statement
6. Three letters of recommendation from university instructors and/or professional associates
7. GRE scores are not required for admission to the program if the applicant has a graduate degree; however, GRE scores are required for those applicants who have not completed a graduate degree or who feel their scores will enhance their application.
8. Unofficial transcripts may be submitted for admissions review purposes. However, official transcripts showing degree conferral and documenting all undergraduate and graduate coursework will be required. Students who have not submitted all required official transcripts by the end of their first semester will have a registration hold placed on their account until the documents are received
9. Non-native English speakers may be required to provide proof of English Proficiency as reflected on the [Graduate School's Testing Website](#).

The following deadlines must be observed to receive consideration for admission:

- January 15 - priority consideration for fall semester and to be considered for University Fellowships and other financial support
- March 1 - fall regular admission
- October 15 – spring admission

Degree Requirements

90 total credit hours

The student must maintain a B+ average (3.3) or higher in order to graduate.

Core Courses (6 cr.)

AMST-A 601: Public Problem Solving (American Studies in Theory) (3 cr.)

AMST-A 602: American Studies in Practice (3 cr.)

Methods Courses (18 cr.)

Most departments consistently teach methods courses as part of their graduate programs. Such courses will comprise the foundation for the doctoral program in American Studies. The courses are distributed across three categories: analytical, digital, and quantitative/qualitative. Consultation between a student, the chair of the student's committee, and, if possible, input from the internship director will help determine which courses necessary.

Minor Concentration (12 cr.)

Every student will have at least one minor concentration selected from the list of university-approved Ph.D. minors. Students also have the option of creating, in consultation with their committee, an Individualized Ph.D. minor that brings together courses from a few disciplines.

Electives (24 credits)

Because of the interdisciplinary nature of this Ph.D., the student will choose elective courses that compliment this applied doctoral program. The student will work with the Advisory Committee to identify those courses that best complement the research questions of the Ph.D. concentration and that supplement the theories and areas of cultural study within American Studies. Electives can also be satisfied by coursework already completed prior to acceptance in the doctoral program such as a master's degree or other applicable graduate level work.

Qualifying Exam—Written

All students shall take a written qualifying examination that aims to assess the student's knowledge and readiness to carry out successful research. This exam will be completed by the semester prior to the start of the student's internship.

Internship and Applied Dissertation (30 cr. total; at least 15 credits must be in dissertation)

- AMST-A 801 Doctoral Internship
- AMST-G 805 PHD Thesis

Internship: Among the chief aims of the program is to provide doctoral students in the humanities and social sciences with opportunities to train for careers outside of academia. The doctoral internship required of this program places interns in non-profit, for-profit, and government agencies where they participate full-time in the substantive work of an organization. The doctoral internship serves as part of the research for student dissertations and therefore must be guided by the student's Research Committee.

Dissertation: The American Studies doctoral program encourages a student to investigate problems connected with the internship; therefore, the final product will be an applied dissertation. The applied dissertation will contribute to the literature in a student's concentration area. The dissertation must be an original contribution to knowledge and of high scholarly merit. The candidate's research must reveal critical ability and powers of imagination and synthesis. The dissertation is written under the supervision of a research chair and a Research Committee and cannot be a collection of unrelated published papers. There must be a logical connection between all components of the dissertation, and these must be integrated in a rational and coherent fashion. It is the responsibility of the student's Research Committee

to determine the kind and amount of published material that may be included in a dissertation. At least 15 hours of AMST-G 805 (Ph.D. Thesis) must be completed.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course descriptions

- **AMST-A 601: Public Problem Solving (American Studies in Theory) (3 cr.):** This course examines theoretical approaches to the meaning of 'America' by asking students to master theories in the field of American Studies, including post-structuralism, queer studies, and post-colonialism as well as race, gender, sexuality, class, and religion. Students will apply them to a particular question or problem of academic interest.
- **AMST-A 602: American Studies in Practice (3 cr.):** The course examines case studies in three different contexts-local (Indianapolis), national (Detroit), and international (Copenhagen)-to illustrate different types of urban development. Students will combine American Studies theories with the practical methods derived from case studies to distinguish characteristics and conditions dependent on geographic and cultural differences.
- **AMST-A 801: Ph.D. Internship (variable credit course; 1 – 6 cr.):** The doctoral internship required of this program places interns in non-profit, for-profit, and government agencies where they participate in the substantive work of an organization. The doctoral internship serves as a significant part of the research for student dissertations and therefore must be guided by the student's research committee.
- **AMST-G 620 Colloquium in American Studies (3 - 4 cr.):** Readings, reports, and discussions on different aspects of American culture. Topics and instructors will change each time the course is offered.
- **AMST-G 751 Seminar in American Studies (3 – 4 cr.):** Intensive study of specific topics in American culture and history with emphasis on developing skills in interdisciplinary research. These seminars will culminate in a 20+-page research paper. Topics and instructors will change each time the seminar is offered.
- **AMST-G 753 Independent Study (1 – 4 cr.)**
- **AMST-G 805: Ph.D. Thesis (variable credit course; 1 – 12 cr.):** Doctoral students in this program must complete at least 15 hours of Ph.D. thesis.

Note: Other courses should be selected in consultation with the students' Advisory Committee.

Anatomy, Cell Biology, and Physiology

School of Medicine

Departmental email: anatinfo@iu.edu

Departmental URL: medicine.iu.edu/anatomy-cell-biology-physiology

Graduate Advisor

Joseph P. Bidwell*, Ph.D., Chair of Graduate Studies Committee, 635 Barnhill Drive, MS1030, Indianapolis, IN 46202-5120, (317) 278-1142, jbidwell@iu.edu

Curriculum

Degrees Offered

Master of Science in Anatomy, Cell Biology & Physiology
Doctor of Philosophy in Anatomy, Cell Biology & Physiology

Special Departmental Requirements

(See also general Graduate School requirements.)

Admission Requirements

Bachelor's degree, preferably with a strong background in the sciences. Candidates should have a minimum grade point average of 3.0 (B) overall, and 3.0 in science courses. The Graduate Record Examination General Test or Medical College Admission Test is optional. Test of English as a Foreign Language is required of international applicants. A personal interview may be requested.

Program Learning Outcomes

1. Demonstrate an advanced understanding of biomedical knowledge by the ability to effectively teach structure-function relationships of the human body.
2. Apply evidence-based pedagogy in the classroom, anatomy lab, and small-group setting.
3. Apply quantitative and qualitative research methodologies to medical education research questions and demonstrate an understanding of the relevant literature.
4. Demonstrate the ability to conduct independent medical education research by reviewing the literature, formulating suitable research questions, selecting the appropriate research methodologies, analyzing the results, drawing reasonable conclusions based on the data, and recognizing limitations of the study
5. Display effective classroom management and ensure equitable treatment of all students.
6. Exhibit strong written and oral presentation skills when communicating with students.
7. Exhibit strong written and oral presentation skills when communicating research findings.
8. Conduct ethical medical education research with human subjects.
9. Display respect for students in the learning environment and maintain a professional demeanor at all times.

Master of Science Degree in Anatomy, Cell Biology & Physiology

The M.S. degree in Anatomy, Cell Biology & Physiology is offered in three different learning tracks that prepare students for successful careers in research, teaching, or the health professions. This is an independent degree and not required as a prerequisite for the doctoral degrees. All M.S. tracks require a total of 30 credit hours for the degree. Students must maintain an overall B (3.0) average

in course work and earn and no less than a B- in any required or elective course.

Translational Biomedical Research Track M.S.

Program Description

This two-year, 30-credit program is designed for individuals who wish to pursue careers in biomedical research and can serve as either a terminal degree or as preparation for Ph.D. studies. Applications for the research M.S. are considered only after the potential student reaches a mentoring agreement with a faculty member with whom the research work will be done.

Degree Requirements

The degree program requires 17-22 credit hours of didactic coursework on the fundamentals of modern research biology and 8-13 credit hours of research.

Required Core Courses (all of the following)

- GRDM-G715 Biomedical Sciences I (2 cr.)
- GRDM-G716 Biomedical Sciences II (2 cr.)
- GRDM-G717 Biomedical Sciences III (2 cr.)
- One of the following courses
 - PHSL-F503 Human Physiology (5 cr.)
 - ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)

Required Core Electives: Students are required to take 3-5 credit hours chosen from the lists of the *Cell and Molecular Biology Core Electives* and/or the *Integrative Systems Core Electives*. Students may use additional/alternative electives in their plan of study with the approval of the graduate adviser and the ACBP Graduate Studies Committee. Students completing this MS track as an exit Master's from the TBR-PhD program can take a combination of these Required Core Electives and courses from their declared Minor.

Cell and Molecular Biology Core Electives

- BIOL-57410 Molecular and Cellular Bone Biology (3 cr.)
- GRDM-G720 Stem Cell Biology (2 cr.)
- GRDM-G724 Molecular Cancer Genetics (1 cr.)
- GRDM-G725 Gene Therapy (1 cr.)
- GRDM-G728 Fundamental Concepts of Infection and Pathogenesis (1 cr.)
- GRDM-G729 Introduction to Immunological Systems (1 cr.)
- GRDM-G743 Fundamentals of Electrical Signaling & Ion Channel Biology (2 cr.)
- GRDM-G744 Neuropharmacology of Synaptic Transmission: Receptors and Ligands (2 cr.)
- GRDM-G745 Intracellular Signal Transduction (2 cr.)
- GRDM-G749 Introduction to Structural Biology (1 cr.)
- GRDM-G761 Molecular & Cellular Physiology of Ion Channels (1 cr.)
- GRDM-G782 Physiology and Pathophysiology of Lipid Rafts (1 cr.)
- GRDM-G801 Cell Biology of the Neuromusculoskeletal System (4 cr.)
- GRDM-G807 Structural and Chemical Biology (2 cr.)
- GRDM-G817 Molecular Basis of Cell Structure and Function (2 cr.)

- GRDM-G819 Basic Bone Biology (3 cr.)
- GRDM-G848 Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr.)
- GRDM-G852 Concepts of Cancer Biology (2 cr.)
- PHAR-G751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr.)

Integrative Systems Core Electives

- ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)
- ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr.)
- ANAT-D701 Translational Neuroscience (5 cr.)
- ANAT-D853 Human Developmental Anatomy (3 cr.)
- ANAT-D856 Advanced Histology (1-5 cr.)
- ANAT-D864 Advanced Gross Anatomy (1-5 cr.)
- ANAT-D875 Advanced Neuroanatomy (1-5 cr.)
- GRDM-G703 Physiology of the Coronary Circulation (1 cr.)
- GRDM-G707 Physiology of Smooth Muscle (1 cr.)
- GRDM-G708 Cardiac and Coronary Physiology of Exercise (1 cr.)
- GRDM-G727 Animal Models of Human Disease (1 cr.)
- GRDM-G740 Translational Systems Physiology and Pharmacology (2 cr.)
- GRDM-G747 Principles of Pharmacology (1 cr.)
- GRDM-G748 Principles of Toxicology 1 (1 cr.)
- GRDM-G762 Renal Physiology (1 cr.)
- GRDM-G830 Advanced Cardiovascular Physiology (3 cr.)
- GRDM-G831 Concepts and Controversies in Cardiovascular Physiology (2 cr.)
- PHSL-F504 Human Physiology Simulation Lab (2 cr.)
- PHSL-F513 Human Systems Physiology (6 cr.)
- PHSL-F603 Integrated Medical Physiology (3 cr.)
- PHAR-F828 Principles of Pharmaceutical Toxicology in the 21st Century (2 cr.)

Required Research Skill Courses

- GRDM-G505 Responsible Conduct of Research (1 cr.)
- GRDM-G855 Experimental Design and Biostatistics (1 cr.) or PBHL-B561 Introduction to Biostatistics (3 cr.)
- ANAT-D861 Seminar (1 cr.). Note: Enrollment in D861 is required each year in the program, which would be 2 credits assuming two years for degree completion.

Required Research Credits for the M.S. in Translational Biomedical Research

- Students will take ANAT-D860 Research to obtain a total of 8-12 credits.

Total credits required for degree = 30 credit hours

Thesis: Optional

Final Examination

An oral defense is required with the thesis option. Students who elect not to write a traditional thesis with be required to present a brief written report of their research,

using a scientific manuscript format, to three members of the ACBP graduate faculty.

Clinical Anatomy & Physiology Track M.S.

Program Description

This one-year non-thesis program provides students with a rigorous background in the traditional anatomical and physiological disciplines, coupled with training in pedagogy and curriculum as well as supervised experiences teaching anatomy and physiology.

Degree Requirements

Total credits required for degree = 30 credit hours

Required Core Courses (23 credits)

- ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)
- ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr.)
- ANAT D853 Human Developmental Anatomy (3 cr.)
- PHSL-F503 Human Physiology (5 cr.)
- EDUC-J500 Instruction in the Context of Curriculum (3 cr.) or EDUC-P540 Learning and Cognition in Education (3 cr.)
- In certain cases, as determined by the graduate adviser and the ACBP Graduate Committee, GRDM-X620 Human Structure (9cr.) may be substituted for ANAT-D501 and ANAT-D502.

Required Core Electives: Students are required to take 5 credit hours from the elective list below. Students may use additional/alternative electives in their plan of study with the approval of the graduate adviser and the ACBP Graduate Studies Committee.

- ANAT-D700 Educational Research Practicum (2 cr.)
- ANAT-D710 History of Anatomy (2 cr.)
- ANAT-D861 Seminar (1 cr.)
- ANAT-D856 Advanced Histology (1-5 cr.)
- ANAT-D864 Advanced Gross Anatomy (1-5 cr.)
- ANAT-D875 Advanced Neuroanatomy (1-5 cr.)
- BIOC-B500 Introductory Biochemistry (3 cr.)
- BIOL-I 559 Endocrinology (3 cr.)
- BIOL-I 561 Immunology (3 cr.)
- BIOL-57410 Molecular and Cellular Bone Biology (3 cr.)
- BIOL-69700 Special Topics Frontiers of Biology (1-3 cr.)
- EDUC-C750 Topical Seminar (1-6 cr.)
- EDUC-P507 Assessment in Schools (3 cr.)
- EDUC-P514 Life Span Development: Birth to Death (3 cr.)
- EDUC-P540 Learning and Cognition in Education (3 cr.)
- EDUC-W531 Technology for Teaching and Learning (3 cr.)
- GRDM-G747 Principles of Pharmacology (1 cr.)
- GRDM-G748 Principles of Toxicology 1 (1 cr.)
- GRDM-G801 Cell Biology of the Neuromusculoskeletal System (4 cr.)
- MSCI-M620 Pedagogical Methods in the Health Sciences (3 cr.)

Required Teaching Practicum for the M.S. in Clinical Anatomy & Physiology

- ANAT-D878 Teaching Practicum (2 cr.), one enrollment required

Pre-Professional Track M.S.

Program Description

This one-year non-thesis program provides students with a rigorous background in the traditional anatomical and physiological disciplines. The curriculum is designed for students with the ultimate goal of earning a professional degree in medically related fields, including allopathic medicine (M.D.), osteopathic medicine (D.O.), dental, or physician assistant programs. Students have the option of obtaining supervised research experience (4 cr. elective).

Degree Requirements

Required Core Courses for the Pre-Professional M.S. (13 cr.)

- ANAT-D509 Learning Strategies in Health Sciences (3 cr.)
- PHSL-F503 Human Physiology (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)

Required Core Electives for the Pre-Professional

M.S.: Students are required to take 17 credit hours from the elective list below. Students may use additional/alternative electives in their plan of study with the approval of the graduate adviser and the ACBP Graduate Studies Committee.

- ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT D527 Neuroanatomy: Contemporary and Translational (3 cr.)
- ANAT-D853 Human Developmental Anatomy (3 cr.)
- BIOC-B500 Biochemistry (3 cr.)
- BIOL-516 Molecular Biology of Cancer (3 cr.)
- BIOL-I 559 Endocrinology (3 cr.)
- BIOL-I 561 Immunology (3 cr.)
- BIOL-574 Molecular and Cell Bone Biology (3 cr.)
- GRDM-G724 Molecular Cancer Genetics (1 cr.)
- GRDM-G725 Gene Therapy (1 cr.)
- GRDM-G727 Animal Models of Human Disease (1 cr.)
- GRDM-G728 Fundamental Concepts of Infection and Pathogenesis (1 cr.)
- GRDM-G729 Introduction to Immunological Systems (1 cr.)
- GRDM-G745 Fundamentals of Intracellular Signal Transduction (1-2 cr.)
- GRDM-G747 Principles of Pharmacology (1 cr.)
- GRDM-G748 Principles of Toxicology 1 (1 cr.)
- GRDM-G749 Introduction to Structural Biology (1 cr.)
- GRDM-G756 Radiation and Cancer Biology (3 cr.)
- GRDM-G761 Molecular and Cellular Physiology of Ion Transport (1 cr.)
- GRDM-G807 Structural & Chemical Biology (2 cr.)
- GRDM G817 Molecular Basis of Cell Structure and Function (2 cr.)
- GRDM-G819 Basic Bone Biology (3 cr.)
- GRDM-G852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)
- GRDM-G855 Experimental Design and Biostatistics (1 cr.)

- MICR-G729 Immunology I - Introduction to the Immune System (1 cr.)
- MICR-J510 Infectious Microbes and Host Interactions (3 cr.)
- PBHL-B561 Introduction to Biostatistics (3 cr.)**
- PHSL-F504 Human Physiology Laboratory Simulations (3 cr.)
- PHSL-F603 Integrated Medical Physiology (3 cr.)
- PHSL-F701 Research in Physiology (4 cr.)*

Required Research Skill Courses for the Pre-Professional M.S.

- ANAT-D861 Seminar (1 cr.)

* Students must register for this course to have research appear on their transcript

** Online course offered in Fall, Spring and Summer terms

Total credits required for degree = 30 credit hours

Doctor of Philosophy in Anatomy, Cell Biology & Physiology

Program Description

The Department of Anatomy, Cell Biology & Physiology offers two Ph.D. tracks. The Research Track is for students intending to pursue careers in laboratory research and most students enter through the Indiana BioMedical Gateway Program (IBMG), or through the direct admit portal if interested in pursuing a research-based program in the classical anatomical sciences. The Education Track is for students who desire a career focus in teaching and educational research. Both Ph.D. tracks require a total of 90 credit hours for the degree.

Degree Requirements Course Requirements for the Research Track Ph.D.

The Research Track Ph.D. is available in two curricular concentrations: Translational Biomedical Research and Anatomical Sciences. A total of 90 credit hours are required for both concentrations. A minimum of 30 credit hours (Translational Biomedical Research) or 34 credit hours (Anatomical Sciences) must be in courses other than dissertation research and lab rotations. The student will devise a Plan of Study based on the Required Core Courses, Required Core Electives, Required Research Skill Courses, Required Minor Courses, and Required Research Credits. Students should confirm the plan of study with the graduate program advisor. All coursework is designed to be completed during the first two to three years to allow a focus on full-time research for the remainder of the program. Graduation within four to six years is strongly encouraged.

Degree Requirements

Required Core Courses for the Curricular Concentration of Translational Biomedical Research

- GRDM-G715 Biomedical Sciences I (2 cr.)
- GRDM-G716 Biomedical Sciences II (2 cr.)
- GRDM-G717 Biomedical Sciences III (2 cr.)

Required Core Courses for the Curricular Concentration of Anatomical Sciences

- ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)

- ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr.)

Electives: Students following the Translational Biomedical Research concentration must take **6 credit hours** from the lists of *Cell and Molecular Biology Core Electives* and *Integrative Systems Core Electives*, with a minimum of 3 credit hours from each list. Students following the Anatomical Sciences concentration must take **4 credit hours** from these listings with a minimum of 2 credit hours from each list. Students may use additional/alternative electives in their plan of study with the approval of the graduate adviser and the ACBP Graduate Studies Committee.

Required Cell and Molecular Biology Core Electives for the Translational Biomedical Research and Anatomical Sciences Curricular Concentrations

- BIOL-I 574 Molecular and Cellular Bone Biology (3 cr.)
- GRDM-G720 Stem Cell Biology (2 cr.)
- GRDM-G724 Molecular Cancer Genetics (1 cr.)
- GRDM-G725 Gene Therapy (1 cr.)
- GRDM-G728 Fundamental Concepts of Infection and Pathogenesis (1 cr.)
- GRDM-G729 Introduction to Immunological Systems (1 cr.)
- GRDM-G743 Fundamentals of Electrical Signaling & Ion Channel Biology (2 cr.)
- GRDM-G744 Neuropharmacology of Synaptic Transmission: Receptors and Ligands (2 cr.)
- GRDM-G745 Intracellular Signal Transduction (2 cr.)
- GRDM-G749 Introduction to Structural Biology (1 cr.)
- GRDM-G761 Molecular & Cellular Physiology of Ion Channels (1 cr.)
- GRDM-G801 Cell Biology of the Neuromusculoskeletal System (4 cr.)
- GRDM-G807 Structural and Chemical Biology (2 cr.)
- GRDM-G817 Molecular Basis of Cell Structure and Function (2 cr.)
- GRDM-G819 Basic Bone Biology (3 cr.)
- GRDM-G848 Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr.)
- GRDM-G852 Concepts of Cancer Biology (2 cr.)
- GRDM-G782 Physiology and Pathophysiology of Lipid Rafts (1 cr.)
- PHAR-G751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr.)

Required Integrative Systems Core Electives for the Translational Biomedical Research and Anatomical Sciences Curricular Concentrations

- ANAT-D501 Human Gross Anatomy (5 cr.)
- ANAT-D502 Basic Histology (4 cr.)
- ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr.)
- ANAT-D701 Translational Neuroscience (5 cr.)
- ANAT-D853 Human Developmental Anatomy (3 cr.)
- ANAT-D856 Advanced Histology (1-5 cr.)
- ANAT-D864 Advanced Gross Anatomy (1-5 cr.)
- ANAT-D875 Topics in Advanced Neuroanatomy (1-5 cr.)
- GRDM-G703 Physiology of the Coronary Circulation (1 cr.)

- GRDM-G707 Physiology of Smooth Muscle (1 cr.)
- GRDM-G708 Cardiac and Coronary Physiology of Exercise (1 cr.)
- GRDM-G727 Animal Models of Human Disease (1 cr.)
- GRDM-G740 Translational Systems Physiology and Pharmacology (2 cr.)
- GRDM-G747 Principles of Pharmacology (1 cr.)
- GRDM-G748 Principles of Toxicology 1 (1 cr.)
- GRDM-G762 Renal Physiology (1 cr.)
- GRDM-G830 Advanced Cardiovascular Physiology (3 cr.)
- GRDM-G831 Concepts and Controversies in Cardiovascular Physiology (2 cr.)
- PHAR-F828 Principles of Pharmaceutical Toxicology in the 21st Century (2 cr.)
- PHSL-F504 Human Physiology Simulation Lab (2 cr.)
- PHSL-F513 Human Systems Physiology (6 cr.)
- PHSL-F603 Integrated Medical Physiology (3 cr.)

Required Research Skill Courses for the Translational Biomedical Research and Anatomical Sciences Curricular Concentrations

- **Ethics:** One of the following research ethics courses:
 - GRDM-G504 Introduction to Research Ethics (2 cr.)
 - GRDM-G505 Responsible Conduct of Research (1 cr.)
 - GRDM-G506 Responsible Conduct of Translational Research (1 cr.)
- **Reagent Validation:**
 - GRDM-G507 Reagent Validation as a Means for Enhanced Research Reproducibility (1 cr.)
- **Statistics:** One of the following statistics courses:
 - GRDM-G855 Experimental Design and Biostatistics (1 cr.)
 - PBHL-B561 Introduction to Biostatistics (3 cr.)
- **Communication:** One of the following research communications courses:
 - COMM-C533 Improvisation for Scientists: Communicating Science (1 cr.)
 - COMM-C534 Distilling Your Message: Communicating Science (1 cr.)
 - ENGL-W533 Science Writing for Public Readers: Communicating Science (1 cr.)
- **Seminar:**
 - ANAT-D861 Seminar (1 cr.). NOTE: 2 credits of D861 are required before the Nomination to Candidacy eDoc can be submitted. Enrollment in D861 is required each year in program until passing the Qualifying Exam.
- **Required Minor Courses for the Translational Biomedical Research and Anatomical Sciences Curricular Concentrations:** All students must select a Minor, which is intended to provide additional breadth and depth to the student's graduate curriculum. The Minor consists of courses, which are outside the major department and may be in one of the basic medical sciences (biochemistry,

medical and molecular genetics, microbiology and immunology, pathology, or pharmacology) or from one of a number of interdisciplinary minors ([see listing of Minors here](#)). An alternative Minor option is to select the Life Sciences Minor. A Minor in life sciences requires a minimum of 12 credit hours outside of the student's major department; 6 of these credits must be in biological sciences. Most Minors require 12 credit hours of course work, although there is some variation. In cases where less than 12 credit hours are required, the student will take additional elective courses from the elective course lists above. The student's advisory committee must approve the Minor.

- **Required Research Credits for the Translational Biomedical Research and Anatomical Sciences Curricular Concentrations:** Students will take ANAT-D860 Research to obtain a total of at least 90 credits for the Ph.D. degree. NOTE: All first-year IBMG Ph.D. students complete three, eight-week rotations GRDM-G718 Research in Biomedical Science (2 cr. each). These 6 credits can be applied toward the research credits.

Degree Requirements for the Anatomy & Physiology Education Track Ph.D.

A total of 90 credit hours are required.

Required Core Courses for the Anatomy & Physiology Education Track Ph.D.

- GRDM-X620 Human Structure (9 cr.)
- ANAT-D853: Human Developmental Anatomy (3 cr.)
- Neuroscience (choose one):
 - ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr.)
 - GRDM-X660 Neuroscience and Behavior (6 cr.)
 - ANAT-D701 Translational Neuroscience (5 cr.)
- Physiology and Disease (choose one):
 - GRDM-X640 Fundamentals of Health and Disease (6 cr.)
 - PHSL-F503 Human Physiology (5 cr.)
- Students must take a minimum of 9 hours of advanced coursework in biomedical sciences, education, or statistics. Students may use additional/alternative electives in their plan of study with the approval of the graduate adviser and the ACBP Graduate Studies Committee.

Required Core Electives for the Education Track Ph.D.

- ANAT-D700 Educational Research Practicum (2 cr.; take at most 6 credits)
- ANAT-D710 History of Anatomy (2 cr.)
- ANAT-D856 Advanced Histology (1-5 cr.)
- ANAT-D864 Advanced Gross Anatomy (1-5 cr.)
- ANAT-D875 Advanced Neuroanatomy (1-5 cr.)
- EDUC-C795 Dissertation Proposal Prep (3 cr.)
- EDUC-Y612 Critical Qualitative Inquiry I (3 cr.)
- One of the following research communications courses:
 - COMM-C533 Improvisation for Scientists: Communicating Science (1 cr.)

- COMM-C534 Distilling Your Message: Communicating Science (1 cr.)
- ENGL-W533 Science Writing for Public Readers: Communicating Science (1 cr.)

Required Minor Courses for the Education Track

Ph.D.: A minimum of 18 credit hours of education coursework including the following courses:

- MSCI-M620 Pedagogical Methods in the Health Sciences (3 cr.) or SHRS-W672 Teaching Practicum in Health and Rehabilitation Sciences (3 cr.)
- EDUC-J500 Instruction in the Context of Curriculum (3 cr.) or EDUC-C750 Curriculum in Higher Education (3 cr.)
- EDUC-P540 Learning & Cognition in Education (3 cr.) or EDUC-I540 Learning & Cognition in Education
- EDUC-Y521 Methodological Approaches to Educational Inquiry (3 cr.) or EDUC-Y520 Strategies for Educational Inquiry (3 cr.)
- EDUC-Y611 Qualitative Inquiry in Education (3 cr.)
- One course selected from the following list:
 - EDUC-Y525 Survey Research Methodology (3 cr.)
 - EDUC-Y603 Statistical Design of Education Research (1-3 cr.)
 - EDUC-C750 Topical Seminar (3 cr.) or another education course if approved by the program advisor

Required Teaching Practicum for the Education Track

Ph.D.: ANAT-D878 Teaching Practicum (2 cr.), three enrollments required. NOTE: Education track students are required to teach Fall, Spring, and Summer terms during the academic year and teaching will be evaluated formally in three different departmental courses. These formally evaluated teaching rotations are required before the Nomination to Candidacy eDoc can be submitted.

Required Research Skill Courses for the Education Track

Ph.D.: Students are required to take the following research skill courses:

- **Statistics:** Two courses
 - EDUC-Y502 Intermediate Statistics Applied to Education (3 cr.)
 - EDUC-Y712 Applied Multivariate Statistics in Education Research or EDUC-Y604 Multivariate Analysis in Educational Research (3 cr.) or
- **Seminar**
 - ANAT-D861 Seminar (1 cr.). NOTE: 2 credits of D861 are required before the Nomination to Candidacy eDoc can be submitted. Enrollment in D861 is required each year in program until passing the Qualifying Exam.

Required Research Credits for the Education Track

Ph.D.: Students will take ANAT-D860 Research to obtain a total of at least 90 credits for the Ph.D. degree.

Requirements for Both the Research and Education Tracks

Grades

Students must maintain an overall B (3.0) average in course work and earn and no less than a B- in any required or elective course.

Advisory Committee

Each Ph.D. student is required to assemble and meet with their advisory committee at least two times per year for the duration of this graduate training program. At the start of the meeting, the student typically provides the committee with a written progress report (a copy of the presentation, for example) and give a brief (approximately 30 min.) oral presentation of his/her research progress. The presentation should include the original aims and a summary of the progress made toward the completion of those aims.

Qualifying Examination for Ph.D. Candidacy

The student's Advisory Committee will administer both written and oral exams to assess the student's preparedness to carry out a rigorous program of biomedical or educational research.

Research Committee

Following the successful completion of the qualifying examination, students and major advisors select a research committee. The composition of the research committee is typically the same as the advisory committee and in most cases the two committees are identical. Approval of research committee members is granted by the graduate school.

Final Examination

The student's Research Committee will set the date for the student's oral defense of the dissertation. Further details of departmental policies will be made available to the student on request and at the time of enrollment.

Ph.D. Minor in Cardiovascular Sciences

The objective of the Cardiovascular Sciences minor is to provide students with a comprehensive background and understanding of integrative cardiac, vascular, renal, and pulmonary (patho)biology. This objective will be accomplished by providing students with a wide variety of options to advance their education in the area with advanced didactic coursework as well as student-driven journal clubs.

Minor Requirements (12 credit hours total)

Required Courses (5 credit minimum)

- Human Physiology- Choose 1
 - PHSL-F 503 Human Physiology
 - PHSL-F 513 Human Physiology
- PHSL-F 603 Integrated Medical Physiology (3 cr.)
- GRDM-G831 Concepts & Controversies in Cardiovascular Science (2 cr.)
- Complete one of the following:
 - GRDM-G740 Translational Systems Physiology & Pharmacology (2 cr.) for this minor if no prior systems physiology coursework
 - Any similar systems physiology course approved by the student's minor advisor and advisory committee (minimum of 1 cr.)

- If a systems physiology course is required for their major area (Ex. PHSL-F503, PHSL-F513) or taken as an elective in their PhD program of study at large, they are exempt from this requirement and can take additional electives toward their minor

Minor Electives - choose from the following courses (take enough courses to fulfill the remaining credit hours towards the minor)

- PHSL-F592 Intro to Biomolecular Imaging (3 cr.)
- PHSL-F503 Human Physiology (5 cr.)
- PHSL-F513 Human Systems Physiology (6 cr.)
- GRDM-G703 Physiology of the Coronary Circulation (1 cr.)
- GRDM-G704 Physiological Proteomics (1 cr.)
- GRDM-G706 Designer Mice – Transgenes and Knockout Animals (1 cr.)
- GRDM-G707 Physiology of Smooth Muscle (1 cr.)
- GRDM-G708 Cardiac & Coronary Physiology of Exercise (1 cr.)
- GRDM-G712 In vivo Microcirculatory Physiology (1 cr.)
- GRDM-G713 Angiogenesis (1 cr.)
- GRDM-G714 Development of the Vascular System (1 cr.)
- GRDM-G715 Biomedical Science I (2 cr.)
- GRDM-G716 Biomedical Science II (2 cr.)
- GRDM-G717 Biomedical Science III (2 cr.)
- GRDM-G743 Fundamentals of Electrical Signaling & Ion Channel Biology (2 cr.)
- GRDM-G744 Neuropharmacology of Synaptic Transmission: Receptors and Ligands (2 cr.)
- GRDM-G745 Intracellular Signal Transduction (2 cr.)
- GRDM-G747 Principles of Pharmacology (1 cr.)
- GRDM-G761 Molecular & Cellular Physiology of Ion Transport (1 cr.)
- GRDM-G762 Renal Physiology (1 cr.)
- GRDM-G782 Physiology & Pathophysiology of Lipid Rafts (1 cr.)
- GRDM-G805 Diabetes and Obesity (2 cr.)
- GRDM-G825 Advanced Topics in Molecular Biology (w cr.)
- GRDM-G848 Bioinformatic Applications to Proteomics and Genomics (2 cr.)
- Another relevant course approved by the student's minor advisor and advisory committee

Minor Program Notes

The minor program will be approved by the student's advisory committee which will take into consideration the student's total didactic experience. The advisory committee may approve additional and/or substitution of appropriate courses to complete the degree requirements. The minor representative on this Committee will be selected from outside the student's major program.

For more information see: medicine.iu.edu/anatomy-cell-biology-physiology

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

- **BIOL-N461 Cadaveric Human Anatomy** (5 cr.) P: BIOL N261 Human Anatomy or permission of instructor. This course is designed as an intensive learning experience for upper-level, motivated undergraduate students who desire an advanced understanding of human anatomy; especially those who intend to pursue a health professional career.
- Through the use of cadaveric dissection, prosected materials, and digital images, students will explore the structure of the human body, with an emphasis on functional anatomy and clinical correlations.
- **GRDM-X620 Human Structure** (9 cr.) The Human Structure course is designed to provide students with an integrated microscopic-to-macroscopic understanding of the structural organization underlying many of the functions of the human body. In addition, students are exposed to the developmental processes responsible for the unique structural and spatial relationships associated with the various organ systems of the body. On completion, students will have a sound framework of anatomical knowledge on which to build their future understanding of disease and treatment. Note: Enrollment is restricted to medical students and graduate students in the Education Track PhD Program in Anatomy, Cell Biology & Physiology.
- **ANAT-D501 Human Gross Anatomy** (5 cr.) Enrollment requires consent of instructor. Gross anatomy lecture and laboratory course. Introduction to the concepts, terminology, and basic structure of the human body. Dissection of the body will use a regional approach. Emphasis on providing fundamental knowledge of the structure/function of major organ systems, musculoskeletal system, peripheral nervous system, and vascular supply to the trunk, head and neck, limbs, and back.
- **ANAT-D528 Gross Anatomy for Health Care Professionals** (5 cr.) Enrollment requires consent of instructor. A graduate level anatomy course for students in the physician assistant, physical therapy, and occupational therapy programs. This is an introductory course in human gross anatomy designed to introduce the principal concepts, basic structure, and function of the human body. Students will have the opportunity to learn, through human cadaveric dissection, clinical and functional correlates of human anatomy.
- **ANAT-D502 Basic Histology** (4 cr.) A graduate-level course designed to provide fundamental histological knowledge upon which to build a deeper understanding of the human body. The course uses Team-Based Learning (TBL) and optic and virtual microscopy to deliver course content.
- **ANA-D853 Human Developmental Anatomy** (3 cr.) P: D501 or D528 or concurrent registration. Graduate-level course that provides a detailed study of the developing human body from conception to birth. Classical anatomical embryology will be emphasized, including consideration of major congenital malformations. Will be taught as a

directed self-study course with case-based learning exercises and assigned readings.

- **ANAT-D701 Translational Neuroscience** (5 cr.) Enrollment requires consent of instructor. This graduate course uses a multidisciplinary approach to integrate the basic with the clinical neurosciences in understanding the human nervous system and select neurological disorders. Particular emphasis will be placed on deficits of motor function resulting from injury or disease. The functional anatomy of the brain and spinal cord will be studied using histologic atlas cross-sections and neuroradiologic images. Working as interdisciplinary teams, doctoral students in the biomedical sciences and rehabilitation sciences will explore relevant clinical cases in team-based activities.
- **ANAT-D527 Neuroanatomy: Contemporary and Translational** (3 cr.) Graduate level neuroscience course providing an introduction to terminology, pathways, organization, and current research-based concepts of the human nervous system. Emphasis on providing fundamental knowledge of the structure, neurochemistry, and molecular mechanisms of the central and peripheral nervous systems in health and disease.
- **ANAT-D710 History of Anatomy** (2 cr.) This graduate seminar course will survey the development of the anatomical sciences—gross anatomy, histology, neuroanatomy, and embryology—from antiquity to the present. Through assigned readings, lectures, and discussions, students will explore the work of the great anatomists and their discoveries. Particular emphasis will be placed on the evolution of anatomy as a discipline and the cultural influences, scientific controversies, and ethical dilemmas facing its practitioners.
- **PHSL-F503 Human Physiology** (5 cr.) P: Introductory biology (K101, K103), organic chemistry (C341, C342), and physics (P201, P202), or equivalent. Advanced course in human physiology designed for students with no prior exposure to the discipline. Emphasis on basic physiological mechanisms of control with regard to membrane, neural, endocrine, reproductive, muscle, cardiovascular, respiratory, gastrointestinal, renal, and multi-systems physiology.
- **PHSL-F504 Human Physiology Simulation Lab** (2 cr.) Students will use computer simulations to study and understand fundamental concepts in human physiology. The areas covered include cardiovascular, skeletal, neural, muscular, respiratory, exercise, renal, endocrine and reproduction
- **PHSL-F513 Human Systems Physiology** (6 cr.) Neurophysiology, physiology of muscular activity, respiration, circulation, gastrointestinal physiology, excretion, metabolism, and endocrinology. Emphasis on basic physiological mechanisms and control systems.
- **PHSL-F603 Integrated Medical Physiology** (3 cr.) P: PHSL-F 503 Human Physiology. This course will provide students and fellows with the opportunity to extend their knowledge of human physiology by investigating the mechanisms of human diseases and understanding how physiological systems interact in order to maintain homeostasis in health and disease. A combination of lectures and team-based learning will be integrated with discussion of articles from the primary literature to develop the students understanding of how diseases affect the integrated physiology of humans.
- **ANAT-D856 Advanced Histology** (1-5 cr.) P: X620 or D502. In depth consideration of selected topics on the microscopic anatomy of cells, tissues, and organs.
- **ANAT-D864 Advanced Gross Anatomy** (1-5 cr.) P: X620, D501, or D528. Functional, clinical, and developmental gross morphology of specific regions of the human body; special topics may vary.
- **ANAT-D875 Advanced Neuroanatomy** (1-5 cr.) P: D527 or D701. Examination of the anatomy and related physiology and neurochemistry of selected brain areas. Topics will include regional structures (in spinal cord, brain stem, diencephalon, or telencephalon) or specific neurological systems (sensory, motor, or autonomic-visceral). Area of study to be arranged with instructor.
- **PHSL-F595 Advanced Physiology** (1-4 cr.) Consent of instructor. This course focuses on in depth study of particular aspects of physiology; to be arranged with members of faculty.
- **PHSL-F701 Research in Physiology** (cr. arr.) Students cover fundamental concepts of cellular and integrative physiology of tissues and organ systems. Basic physiology of the neural, musculoskeletal, cardiovascular, respiratory, renal, endocrine, and gastrointestinal systems is included. At the end of the course, students should have a basic understanding of the physiologic functions of cells, tissues, and organ systems and should understand modern approaches for the measurement and interpretation of physiologic functions.
- **GRDM-G703 Physiology of the Coronary Circulation** (1 cr.) P: Graduate physiology. Advanced study of the physiology, pharmacology, and pathophysiology of the coronary circulation using contemporary methods. Overall goal is to provide a rational basis for functional genomics and modern therapy.
- **GRDM-G707 Physiology of Smooth Muscle** (1 cr.) P: Graduate-level physiology course. Advanced study of the physiology of the smooth muscle tissues with focus on the normal physiology and pathophysiology of airway smooth muscle and the airways. Biochemical and physiologic mechanisms in the regulation of contraction, growth, and phenotypic expression in smooth muscle tissues will be explored.
- **GRDM-G708 Cardiac and Coronary Physiology of Exercise** (1 cr.) P: Graduate integrative physiology. Exercise stimulus, quantification of work, and in vivo responses and adaptations involved in cellular and

molecular mechanisms of myocardial and coronary artery responses and adaptations to exercise.

- **GRDM-G761 Molecular and Cellular Physiology of Ion Channels** (1 cr.) P: Graduate cellular physiology. Advanced ion transport topics selected from current research on channels, pumps, and exchangers. Topics include transporter biophysical characteristics, long-term regulation, and electrophysiological and optical methods for study.
- **GRDM-G762 Renal Physiology** (1 cr.) P: Graduate physiology. Reading and discussion of classical papers in renal physiology. Laboratory experiences will include measurement of renal functions using clearance methods and demonstrations of micro-puncture and in vivo techniques.
- **GRDM-G782 Physiology and Pathophysiology of Lipid Rafts** (1 cr.) P: Graduate cell biology. To acquire a core of essential principles about lipid raft structure and comprehensive insight into the functional process of these membrane domains by means of introductory lectures, review of current literature, and group discussions with an emphasis on experimental techniques used to examine membrane physiology.
- **GRDM-G801 Cell Biology of the Neuromusculoskeletal System** (4 cr.) Enrollment requires consent of instructor. The overall objective of this graduate course is to present, in an experimental context, information integrating cell structure with cell function. The specific focus is on topics in which new information on cell function has enhanced or reformulated our understanding of cell biology of the neuromusculoskeletal system.
- **GRDM-G819 Basic Bone Biology** (3 cr.) P: one semester of introductory biology. An introduction to basic bone biology, including bone morphology, composition and physiology; cell biology of bone cells; measurement techniques; adaptation to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development.
- **GRDM-G830 Advanced Cardiovascular Physiology** (3 cr.) P: Graduate physiology. Advanced (3 cr.) study of the physiology, pharmacology, and pathophysiology of the cardiovascular system using contemporary methods is emphasized. Concepts of cardiovascular structure, function, hemodynamics, excitation-contraction coupling, signal transduction and electrophysiology are reinforced.
- **GRDM-G831 Concepts and Controversies in Cardiovascular Science** (3 cr.) P: Graduate physiology. Reading and in-depth discussion of current concepts and controversies in the field. Classes involve student presentations of relevant manuscripts in journal club like format.
- **GRDM-G855 Experimental Design and Research Biostatistics** (1 cr.) This course will provide students with a functional understanding of experimental design and statistical testing in the biological sciences. Students will learn why a thoughtful approach to the design of their experiments and a rigorous, unbiased testing of their results are both important to their work and future careers. Students will receive an introduction to basic statistical theory with a practical focus on interpreting printouts from a variety of statistical programs (rather than a focus on students carrying out their own calculations). Practical examples of experimental design and statistical testing-both good examples and bad-will be worked through for a variety of real situations in biomedical research.
- **ANAT-D700 Educational Research Practicum** (2 cr.) P: Consent of instructor. This course is designed to provide students with structured and supervised educational research experiences, as well as critical reviews of individual performance. May be repeated for credit.
- **ANAT-D878 Anatomy Teaching Practicum** (2 cr.) P: Consent of instructor. This course is designed to provide each student with supervised teaching experiences in gross anatomy, histology, and neuroscience, as well as critical reviews of all teaching duties. May be repeated for credit.
- **ANAT-D899 Senior Elective in Anatomy** (cr. arr.) A variety of medical student electives are offered within the department. Specific information on each elective is available in the Senior Elective Program Course Listing, which is published in February each year. These electives are offered in the Medical Center facilities and in approved programs in clinics and hospitals throughout the state.
- **PHSL-F898 Senior Elective in Physiology** (cr. arr.) This course provides students with focused special topic to be arranged by student's mentor with consent of program director.
- **ANAT-D861 Seminar** (1 cr.) Required of all graduate students in residence. Literature and research reports and discussions by faculty, students, and distinguished visitors.
- **ANAT-D860 Research** (cr. arr.) Enrollment requires consent of instructor.
- **ANAT-G901 Advanced Research (6 cr.) P: Admission to PhD candidacy. Enrollment requires** completion of over 90 credit hours and consent of instructor. This course provides the advanced research student with a forum for sharing ideas and problems under the supervision of a senior researcher.
- **PHSL-G901 Advanced Research (6 cr.) P: Admission to PhD candidacy. Enrollment requires** completion of over 90 credit hours and consent of instructor. This course provides the advanced research student with a forum for sharing ideas and problems under the supervision of a senior researcher.

Anthropology

School of Liberal Arts

Departmental email: Admin: teamgrad@iu.edu; or Graduate Program Director: wilsojer@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/anthropology

Curriculum

Courses

Degrees Offered

Master of Arts in Applied Anthropology

Program Overview

The M.A. in Applied Anthropology at IU Indianapolis offers students the opportunity to use anthropological theories and methods toward the goals of solving real-world problems. The program is constructed around a set of core courses together with mentored research projects and internships with community stakeholders. The degree takes advantage of our long-standing departmental strengths in Public Archaeology, Urban Anthropology, International Development, Globalization, Medical Anthropology and Museum Studies. Students may choose to follow a targeted curriculum, focusing on a particular aspect of the discipline; all students will also be well-trained in a broad range of anthropological approaches.

Admission Requirements

1. Bachelor's degree from a regionally accredited institution
2. Unofficial transcripts may be submitted for admissions review purposes. However, official transcripts showing degree conferral and documenting all undergraduate and graduate coursework will be required. Students who have not submitted all required official transcripts by the end of their first semester will have a registration hold placed on their account until the documents are received.
3. Minimum grade point average of 3.0 (B) overall from undergraduate studies
4. Appropriate work experience and undergraduate coursework will be considered in making decisions about admission. Applicants who demonstrate other strengths and good preparation for the program will be considered.
5. Personal statement
6. Three letters of recommendation from professionals familiar with the applicant's academic or professional background.
7. Non-native English speakers may be required to provide proof of English Proficiency as reflected on the [Graduate School's Testing Website](#).
8. The following deadline must be observed to receive consideration for admission: March 1 - for fall semester

Course Requirements

This is a 36-credit hour program. All coursework must be completed with a grad of C or better. Students must maintain a program GPA of at least 3.0.

Core courses (6 cr.)

- ANTH-E 501 Fundamentals of Applied Anthropology (3 cr.)
- ANTH-A 565 Anthropological Thought (3 cr.)

Methods course in the student's sub-disciplinary area (3 cr.)

- ANTH-E 606 Ethnographic Methods (3 cr.)
- ANTH-A 560: Variable Topics In Anthropology
 - Archaeological Method & Theory (3 cr.)
 - Fieldwork in Archaeology (3 cr.)

Elective courses (21 cr.)

Course electives should be chosen from the program's Plan of Study. Options are available from within and outside of Anthropology, including appropriate cognate courses from programs that are already well-developed at IU Indianapolis including Museum Studies, Urban Policy (SPEA), Urban Education, Geographic Information Science (GIS), Community Nursing, and Public History. No more than 9 credits of ANTH-A 560 are permitted.

Thesis or Project (6 cr.)

To earn the M.A., students are required to complete either an internship, which involves writing a report for the organization or agency, submit an article for peer review to a reputable academic journal, or complete a more traditional M.A. thesis.

Internship Option (6 cr.) A student will be placed with a non-governmental organization, a city or county agency, a museum or other Cultural Resource Management organization, or a community-based organization and will arrange with the sponsoring organization to complete a project that will be mutually agreed upon by the student's committee in the Anthropology Department and the organization. Note: The internship may be taken for variable credits depending on the amount of contact hours with the equivalence of 50 hours per credit hour unless constructed as a graduate assistantship in accordance with Anthropology Department policy in which case the contact hours may be greater.

Thesis Option (6 cr.) A student would develop and write a thesis supervised by a three-member committee of full-time faculty. In most cases, the thesis would explore a research question related to some aspect of the urban setting of greater Indianapolis and Central Indiana or archaeology and heritage management in the Midwest, and would demonstrate the ability of a student to work independently on that topic, and to apply both theoretical insight and methodological skills to a substantive issue. A student would be required to successfully defend the thesis before a thesis committee.

Evidence of Publishable and Professional Research Option (6 cr.) Rather than producing a traditional M.A. thesis, in accordance with the student's advisor, students will be allowed to write a research paper that is assessed to be publishable in a refereed journal. Alternatively, for students primarily interested in a focus on Museums or in Cultural Resource Management, the advisor might suggest that the student develop and produce a public exhibit in Indianapolis or Central Indiana. Lastly, students may be permitted to produce a report that contributed significantly to a policy issue in Indianapolis or Central Indiana. Student articles may be submitted for publication to a variety of peer-reviewed journals and scientific merit will also be assessed by the student's committee.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

ANTH-A 507 Indigenous Cultural Heritage (3 cr.)

Students will explore the deeper meanings of Indigenous cultural heritage expressed in both tangible culture and intangible customs, values, practices, artistic expressions, oral tradition, ritual, memory, sense of place, and identity. Students will consider deeper meanings embedded in heritage and the relationships. Relying heavily on the scholarship of Indigenous authors.

ANTH-A 509 Cross-Cultural Dimensions of Philanthropy (3 cr.)

This course examines philanthropy across a variety of cultures, both past and present. The issues under consideration include: the place of giving, altruism, community action, and public responsibility in general human cultural evolution; the operation of voluntary organizations and other philanthropic endeavors in non-western nations today; and, the rise and meaning of international philanthropic efforts.

A532 The African Diaspora (3 cr.) This course examines the cultural formation of the African Diaspora in the Americas, the Caribbean, Europe and Africa. The course focuses specifically on the theorization of the African Diaspora within the discipline of Anthropology.

ANTH-A 560 Graduate Topics in Anthropology (3 cr.)

This seminar course provides a conceptual examination of selected topics in the field of anthropology. May be repeated for up to 9 credits.

ANTH-A 565 Anthropological Thought (3 cr.) This course traces the development of anthropological theory from the early 20th century up to the present. Students will examine what is distinctive about an anthropological perspective and will analyze how anthropological ideas have shifted over the last century in accordance with the emergence of new social and political imperatives.

ANTH-A 594 Independent Learning in Applied

Anthropology (2-4 cr.) P: Authorization of instructor. Independent research/training using anthropological perspectives/methods in addressing social issues. The project must be a discrete activity with a concrete product, conducted in conjunction with the student's anthropology advisor and the member of the organization.

ANTH-A 699 Master's Project in Applied Anthropology

(1-6 cr.) The completion of a scholarly applied project is an essential element of the MA in Applied Anthropology. This project will be carried out and completed under the direction of the student's graduate advisor.

ANTH-B 526 Human Osteology (3 cr.) Descriptive and functional morphology of the human skeleton with emphasis on the identification of fragmentary remains. Determination of age, sex, and stature; craniology; and research methods in skeletal biology. Guided research project in the identification of skeletal material required.

ANTH-E 501 Fundamentals of Applied Anthropology (3 cr.) This is a graduate-level introduction to the history and

underlying principles of Applied Anthropology. We will examine how understanding a specifically anthropological perspective can provide new insights into the workings of contemporary social policies and programs.

ANTH-E 507 Popular Culture (3 cr.) This course studies how traditional anthropological insight can analyze social and political complexities of contemporary popular cultural phenomena. Focuses on how anthropological subjects such as class, racism, and regionalism lurk within popular cultural phenomena including post-1950 music subcultures, civil religion, and consumer culture.

ANTH-E 509 Modern Material Culture (3 cr.) This course examines how contemporary social experience is impacted by material culture ranging from toys to theme parks. Focuses on how consumers perceive themselves and others in modern consumer culture through the medium of commodities and examines systems of inequality that are reproduced and subverted through consumption.

ANTH-E 521 Indians of North America (3 cr.) Assesses the complexities of the academic study of the Indigenous peoples of North America, emphasizing the diversity of Native cultures, representations of them by the public and by scholars, and examining cultural adaptations from Pre-Contact to Contemporary.

ANTH-E 606 Research Methods in Cultural

Anthropology (3 cr.) This course provides an introduction to the use of ethnographic field work methods, including participant-observation, semi-structured interviewing, and use of mapping, among others. Every year this course will focus on a community-based research project.

ANTH-E 616 The Anthropology of Tourism (3 cr.) This course will explore the phenomenon of tourism from an anthropological perspective. It will look at tourism as linked to consumer culture, transnational movements of people and goods, post-colonial settings, global capitalism, and the politics of ethnic and national identities.

ANTH-E 657 Ethnic Identity (3 cr.) This course will analyze how individuals negotiate their ethnic and transnational identities. We will approach the study of ethnic identities from a variety of angles, looking at lived experiences and expressive culture (e.g. music, dance, food, art), and case studies from various countries.

ANTH-E 681 Seminar in Urban Anthropology (3 cr.)

Seminar in cross-cultural urban social organization, emphasizing recruitment manifestations of urbanism in various cultural contexts and techniques of investigation. Practical work required.

ANTH-P 501 Community Archaeology (3 cr.)

Community archaeology implies direct collaboration between a community and archaeologists. Collaboration implies substantial adjustment in archaeological methods and epistemologies incorporating community members in setting research agendas, working on excavations, and interpreting results. This course examines a wide range of issues and looks at both successful and unsuccessful projects to arrive at an assessment of best practices.

Applied Communication

School of Liberal Arts

Departmental email: libarts@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/communication-studies/

Curriculum

Courses

Degrees Offered

Master of Arts in Applied Communication, BA/MA in Applied Communication

Program Overview

The Department of Communication offers a master's program in Applied Communication with optional concentrations in corporate communication, health communication, media studies and public communication. The overarching goal of this unique program in Applied Communication is to provide students with the competencies and skills necessary to address specific communication issues and problems that are socially relevant and to suggest or implement change. The primary intellectual goal of the program is to increase our students' understanding of the theoretical implications of discipline-specific knowledge and to enhance their ability to understand and predict human interaction relative to realistic, applied outcomes associated with contemporary social problems. A practical goal of the program is to educate professionals who grasp the complexities of communication problems and who are able to develop and execute strategies and create programs to address such issues.

Student Learning Outcomes

Students completing the Applied Communication M.A. curriculum will:

- communicate both orally and in writing for professional and academic audiences
- synthesize, critique, and apply theoretical constructs in communication studies
- select and evaluate appropriate methodologies for conducting communication research
- propose and justify solutions to real-world communication problems
- design and conduct guided communication research

Admission Requirements

Our department prides itself on the diversity of majors from which students enter our program of study. Prior to entering our master's program, students should have (1) a baccalaureate degree from an accredited institution, (2) an introduction to research methods, (3) experience in the analysis of communication phenomena, and (4) experience with writing in an academic context. Students who do not have this preparatory work may be admitted provisionally with additional coursework required prior to admission, and/or additional credit hour requirements imposed as a part of the minimum requirements for the Master of Arts degree.

The Department seeks applicants who have strong analytical and writing skills, a strong liberal arts

background, an interest in communication, and applicable work-related experiences. The Admissions Committee considers all indicators of the applicant's ability to complete the degree successfully.

1. Bachelor's degree and transcripts from all universities and colleges attended, with an overall GPA of 3.0.
2. Personal statement
3. Three letters of recommendation (from university instructors and/or professional associates)
4. International students must submit TOEFL or IELTS scores. Information can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317-274-7000.

The following deadlines must be observed in order to receive consideration for admission:

January 15 - priority consideration for fall semester
May 15 - regular fall admission consideration

Course Requirements

Completion of 30 credit hours including:

- 15 credit hours of core requirements. These include:
 - COMM-C 500 Advanced Communication Theory (3 cr.)
 - COMM-C 501 Applied Quantitative Research Methods (3 cr.)
 - COMM-C 504 Pro-Seminar in Comm Graduate Studies (3 cr.)
 - Choose one of the following: COMM-C 502, COMM-C 680, COMM-C 530 or COMM-C 531
 - COMM-C 503 Applied Learning Project or COMM-C 597 Thesis
- 15 elective hours selected from the program's Plan of Study. Each student may take 3 credit hours of interdisciplinary electives from outside of the Department of Communication, as approved by the student's advisor. Electives include:
 - COMM-C 505 PROSEMINAR IN COMMUNICATION STUDIES PEDAGOGY
 - COMM-C 510 HEALTH PROVIDER-CONSUMER COMMUNICATION
 - COMM-C 520 ADVANCED PUBLIC COMMUNICATION
 - COMM-C 521 FAMILY COMMUNICATION IN HEALTH CONTEXTS
 - COMM-C 526 EFFECTIVE MEDIA STRATEGIES
 - COMM-C 528 GROUP COMMUNICATION AND ORGANIZATIONS
 - COMM-C 530 COMMUNICATION CRITICISM
 - COMM-C 531 MEDIA THEORY AND CRITICISM
 - COMM-C 533 IMPROVISATION FOR SCIENTISTS
 - COMM-C 534 DISTILLING YOUR MESSAGE
 - COMM-C 535 ADVANCED SCIENCE AND RESEARCH COMMUNICATION
 - COMM-C 536 CONNECTING WITH THE COMMUNITY
 - COMM-C 540 RHETORICAL THEORY
 - COMM-C 544 ADVANCED RELATIONAL COMMUNICATION

- COMM-C 580 ADVANCED ORGANIZATIONAL COMMUNICATION
- COMM-C 582 ADVANCED INTERCULTURAL COMMUNICATION
- COMM-C 591 TOPICS IN APPLIED COMMUNICATION
- COMM-C 592 ADVANCED HEALTH COMMUNICATION
- COMM-C 593 ADVANCED FAMILY COMMUNICATION
- COMM-C 594 COMMUNICATION AND CONFLICT MANAGEMENT IN ORGANIZATIONS
- COMM-C 598 INTERNSHIP
- COMM-C 599 INDEPENDENT STUDY
- COMM-C 620 COMPUTER MEDIATED COMMUNICATION
- COMM-C 621 PERSUASION
- COMM-C 644 POLITICAL COMMUNICATION
- COMM-C 650 HEALTH COMMUNICATION THROUGH MEDIATED CHANNELS
- The student must maintain a B+ average (3.3) or higher to graduate.
- The student must complete either a thesis or an applied learning project to complete the degree requirements.

5-Year BA/MA in Applied Communication

The Department of Communication also offers a 5-year BA/MA in Applied Communication. The program, which is only available to majors in IU Indianapolis's Department of Communication, allows students to complete a B.A. and an M.A. in five years instead of six. The program consists of three years of undergraduate coursework, a fourth year of combined undergraduate and graduate coursework, and a fifth year of exclusively graduate coursework. The Program Goals and Student Learning Outcomes of the 5-Year BA/MA in Applied Communication are identical to the goals and learning outcomes of the M.A. in Applied Communication.

Admission Requirements

- Qualified Communication Studies majors may apply for the program in the second semester of their junior year. To be eligible to apply, students should have completed at least 60 credit hours overall and 12 hours in the major, including the 9-hour core (G100, G201, and G310). They should have a minimum GPA of 3.3 overall and a 3.5 in their major coursework.
- As part of the application process, students are required to submit two (2) faculty letters of recommendation (at least 1 from a member of the IU Indianapolis Department of Communication faculty) and a single-authored writing sample.
- If students maintain at least a B average in all of the graduate courses taken during their senior year, they will automatically be allowed to continue in the M.A. program, and the graduate courses completed during their senior year will double count towards completion of the M.A. requirements.

Program Structure

- Students accepted into the program may take 12 but no more than 15 hours of graduate coursework in Communication Studies (COMM) during their senior year. These credit hours will count towards both the BA and MA. Graduate courses taken during the senior year must include 3 hours of COMM-C 500 (Advanced Communication Theory) and 3 hours of COMM-C 501 (Quantitative Research Methods). The remaining graduate courses taken during the senior year must be 500-level COMM classes. (NOTE: All courses counting toward the B.A. major must be completed with a grade of C or higher).
- In Year 5, after earning their B.A., students will complete the remaining hours of course work required for the M.A. in Applied Communication as well as their ALP (Applied Learning Project) or Thesis. Students may elect to take classes during the summer between the 4th and 5th year or to write the ALP/Thesis in the summer after the 5th year.

Sample Curriculum

This sample curriculum provides an example of the Communication Studies courses a student could take to complete the major requirements for their B.A. and their M.A. in 5 years, based on the current curriculum plan for the B.A. in Communication Studies.

Sophomore Year-Fall:

- G100: Introduction to Communication Studies

Sophomore Year-Spring:

- G201: Introduction to Communication Theory

Junior Year-Fall:

- G310: Introduction to Communication Research
- Communication Studies Elective (i.e., M150: Media in Contemporary Society)

Junior Year-Spring:

- Communication Studies Elective (i.e., R321: Persuasion)
- Communication Studies Elective (i.e., R310: Rhetoric, Society & Culture)

NOTE: During this semester, qualified students should apply for the accelerated BA/MA program

Senior Year-Fall:

- C500: Advanced Communication Theory
- Graduate Communication Studies Elective (i.e., C580: Advanced Organizational Communication)

Senior Year-Spring:

- C501: Applied Quantitative Research
- Graduate Communication Studies Elective (i.e., C528: Group Communication and Organizations)
- Graduate Communication Studies Elective (i.e., C544: Advanced Relational Communication)

NOTE: At the end of this semester, the student must have completed all of the requirements for a B.A. with a major in Communication Studies. One of the graduate-level courses will substitute for the B.A. Capstone requirement.

Fifth Year-Fall:

- Second Core Methods class (i.e., C531: Media Theory and Criticism)
- Graduate Communication Studies Elective (i.e., C594: Comm. & Conflict Management in Org.)
- Graduate Communication Studies Electives (i.e., C582: Intercultural Communication)

Fifth Year-Spring:

- Graduate Communication Studies Elective (i.e., C520: Advanced Public Communication)
- Applied Learning Project (3 cr) or Thesis (3 cr)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

COMM-C 500 Advanced Communication Theory (3 cr.)

Students explore how scholars from various traditions have described and explained the universal human experience of communication. Students develop an understanding of a variety of communication theories to more completely interpret events in more flexible, useful, and discriminating ways.

COMM-C 501 Applied Quantitative Research

Methods in Communication Studies (3 cr.) The course is designed to offer an opportunity to examine, assess, and conduct quantitative research that employs communication theory and quantitative research methods as a means to test theory in applied settings and/or as a means to applied ends (i.e., problem-solving policy analysis).

COMM-C 502 Applied Qualitative Research Methods in Communication Studies (3 cr.)

P: 6 credits (at any level) of coursework in Communication Studies. Inductive (data-to-theory) approach to knowledge, and associated sequential and non-sequential methods for studying communication in applied everyday situations, e.g., friendships and other close personal dyads, families, small groups, organizations, and public, media, historical, computer mediated, or health-related contexts.

COMM-C 503 Applied Learning Project (3 cr.)

An applied learning project that provides students with a culminating educational experience. The project gives students the opportunity to apply their knowledge of communicative processes to real-life organizational problems, and provides the opportunity to produce a body of work reflecting their abilities.

COMM-C 504 Professional Seminar in Communication Graduate Studies (3 cr.)

The course provides an orientation to graduate school expectations and a stronger grasp of the diverse approaches (methods) to constructing knowledge via Communication Studies Research. Students will be expected to perform at graduate level standards in: 1) writing for an academic audience; 2) thinking and arguing critically; and 3) analyzing and synthesizing published research.

COMM-C 505 Proseminar in Communication Studies

Pedagogy (3 cr.) This course is designed to provide students with a survey of the concepts and strategies

for effective pedagogy in communication. Emphasis is placed on building skills and confidence in designing lessons, using appropriate instructional and assessment strategies, and developing a unique and coherent teaching philosophy.

COMM-C 510 Health Provider-Consumer

Communication (3 cr.) Designed to teach communication skills and practices related to health care talk by examining transactional communication within health care contexts. Topics covered in this course focus directly upon interpersonal dialogue between health care providers and patients.

COMM-C 520 Advanced Public Communication (3 cr.)

Theory and application of oral communication integral to institutional and corporate professionals. Critical analysis of representative manuscripts of American speechmaking, and development and presentation of forms and types of public address for professionals.

COMM-C 521 Family Comm in Health Contexts (3 cr.)

This interdisciplinary seminar focuses on communication involving families in health care settings, addressing significant issues for graduate/professional students who will work with families, including students in Comm. Studies, Nursing, Psychology, Social Work, Public Health, and Medicine. Topics include communication with families about health care concerns and family-patient-health provider systems

COMM-C 526 Effective Media Strategies (3 cr.)

This course specifically focuses on the effective use of media as a means of persuasion. This course explains how ideas are expressed through techniques unique to the language of radio, television, film, and the Internet.

COMM-C 528 Group Communication and

Organizations (3 cr.) This seminar-format course examines the ways in which informal groups and communication networks facilitate a variety of organizational processes (i.e., socialization, diffusion of innovation). Emphasis is placed on developing theoretical understanding of informal groups in organizations as well as on methodological issues involved in studying communication networks in organizations.

COMM-C 530 Communication Criticism (3 cr.)

This course will introduce students to criticism as a method of studying persuasive messages in speeches, fiction, mass media, musical lyrics, political campaign literature, art, and other modes of communication in contemporary culture.

COMM-C 531 Media Theory and Criticism (3 cr.)

A course organized primarily around theories and critical strategies commonly considered within the broad category of contemporary criticism. The course utilizes primary theoretical texts to introduce students to a variety of methodologies employed in analyzing media messages, and emphasizes the application of theoretical frameworks on the analysis of specific media texts.

COMM-C 533 Improvisation for Scientists (1 cr.)

Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 Distilling Your Message (1 cr.) Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

COMM-C 535 Advanced Science and Research Communication (3 cr.) Students will explore the social construction of expertise and discuss how rhetorical and narrative theory informs communication. Via community-based projects, students will collate, synthesize, and translate scientific evidence into information that non-expert audiences (such as policy makers, granting organizations, and the lay public) can access, understand, and act on.

COMM-C 536 Connecting with the Community (1 cr.) Students will theorize and develop techniques for shared meaning-making with community partners. They test methods to develop common ground between experts and community members including the lay public and policy makers. Activities focus on developing trust, open communication, and sharing expertise that values and respects lived experiences of community members.

COMM-C 540 Rhetorical Theory (3 cr.) Despite the prevalence and significance of persuasion in both our personal and professional lives, many people know little about the persuasion process. It is the goal of this course to explore the persuasion process by examining the historical development of rhetorical theory and practice in the Western world, and by studying and applying rhetorical concepts in contemporary culture to our everyday lives.

COMM-C 544 Advanced Relational Communication (3 cr.) An introductory course in interpersonal communication. Applications of communication theory/research in such areas as relational culture and relationship development. Includes a scholarly project on a real relationship, and applications of research to areas such as pedagogy and couple/family therapy.

COMM-C 580 Advanced Organizational Communication (3 cr.) The course provides a solid foundation of concepts for understanding and discussing human organizations. Students will analyze, evaluate, and apply the theories and practices related to organizational issues. Through case studies, readings, and practical applications, this course combines a theory-based understanding of communication in organizations with real-world applications.

COMM-C 582 Advanced Intercultural Communication (3 cr.) Exploration of issues related to the intercultural communication process. Consideration of the role of social, cultural, and historical contexts in intercultural interactions. Examination of the relationship between culture and communication from the socio-psychological, interpretive, and critical perspectives. **COMM-C 591 Topics/Seminar in Applied Communication (3 cr.)** This is a revolving topics course. The changing nature of the topic allows graduate students to explore, synthesize, and integrate knowledge of the field of communication and the particular discipline of applied communication while focusing on a single topic not otherwise addressed in the course of study.

COMM-C 592 Advanced Health Communication (3 cr.) A course designed to teach communication skills and practices related to health care by examining health care communication theory. Topics range across communication levels (interpersonal, intrapersonal, group, organization, mass media, and mediated communication) within a variety of health care contexts.

COMM-C 593 Advanced Family Communication (3 cr.) Applications of theory and research on the role of communication in creating and maintaining marriages/committed couples and families. Includes a scholarly term paper on a real couple or family's communication.

COMM-C 594 Communication and Conflict Management in Organizations (3 cr.) This seminar-format course examines the communication exchanges that facilitate conflict management within organizational contexts. Specific attention is focused on negotiation and mediation; however, the communication of alternative means of conflict and dispute resolution are also discussed. In addition, students will be introduced to methods for assessing conflict interaction in organizations.

COMM-C 597 Thesis (3 cr.) Applied communication students who choose the thesis option will identify a research topic and develop it under the guidance of the student's thesis director (IUPUI professor). The thesis topic will be related to the field of applied communication in its foci and method.

COMM-C 598 Internship (1-3 cr.) This course integrates applied communication theory and practice in a practice setting. Students will apply theoretical concepts and research tools, conduct projects, and interact with communication professionals in the designated setting. In concert with the student's chosen area of concentration, he or she will address issues of importance to that particular organization.

COMM-C 599 Independent Study (1-6 cr.) This course provides students with the opportunity to synthesize and apply knowledge acquired through course work and professional experience into a completed research project in applied communication. Students will work independently on a topic/issue of choice under the guidance of graduate faculty.

COMM-C 620 Computer-Mediated Communication (3 cr.) An overview of practical and scholarly approaches to computer mediated communication. The readings address mass communication, discourse, community, gender, intercultural understanding, ethics, interpersonal relationships, identity, organizational communication, and education.

COMM-C 621 Persuasion (3 cr.) This course takes a rhetorical/critical approach to persuasion in its broadest sense, how it affects our lives everyday and how we can find evidence of persuasive tactics in unexpected places. We will look broadly at theories of persuasion and their application across contexts and fields.

COMM-C 644 Political Communications (3 cr.) This course will examine the public communication involved in various political contexts. We will consider the communication involved in political campaigns, advertising, and oratory; social media, technology, and popular culture; the news, framing, and political media;

citizenship, public deliberation, and decision making in what some argue is a divided political culture. We will read and discuss state of the art research in political communication and meet individuals who are currently working in a communication capacity in public political campaigns.

COMM-C 650 Health Communication Media (3 cr.)

Focus on the effect of media on health behavior.

Theories of health behavior change and media effects examined; applications of theory to health campaigns evaluated. Examples of mediated health campaigns and effectiveness discussed. Considerations include: interplay among theory, research, practice; how theory informs practice; how research aids in theory construction/refinement.

COMM-C 680 Qualitative Research Methods (3 cr.)

Qualitative Research Methods is an introduction to qualitative research methods in communication studies, with an emphasis on health communication research. This course provides a survey of qualitative methodology, including metatheoretical foundations, planning a qualitative study, and gathering and analyzing qualitative data.

Biochemistry and Molecular Biology

School of Medicine

Departmental E-mail: biochem@iu.edu

Departmental URL: medicine.iu.edu/biochemistry-molecular-biology/education-programs/graduate-degrees

Curriculum

Degrees Offered

Doctor of Philosophy in Biochemistry and Molecular Biology
Ph.D. Minor in Diabetes and Obesity

Admission Requirements

Typically, a baccalaureate degree in biology, chemistry, or physics that includes calculus and organic chemistry is required for admission. Requirements align with those stated by the Graduate School.

Doctor of Philosophy in Biochemistry and Molecular Biology

Students are typically admitted through the IBMG (Indiana University School of Medicine BioMedical Gateway) open enrollment program and will take a common curriculum in the first semester and then commit to the Biochemistry and Molecular

Curriculum for Biochemistry and Molecular Biology Ph.D. program

Required General Courses

- GRDM-G 507 Reagent Validation as a Means of Enhancing Research Reproducibility (1 cr.)
- GRDM-G 855 Experimental Design and Research Biostatistics (1 cr.)

- A course in "Responsible Conduct in Research", e.g. GRDM-G504, GRDM-G505, GRDM-G506
- A course in Science Communication: Students take one of the following: COMM-C524, COMM-C533, or ENG-W533

Required Biochemistry and Molecular Biology Courses

- BIOC-B803: Advanced Biochemistry (1 cr.)
 - This course in grant writing will culminate in the submission and oral defense of an "NIH or NSF style" grant proposal on the students intended research topic. The assigned grade for this course is dependent on the successful defense of the proposal that will serve as a qualifying exam and be required for Advancement to Candidacy.
- BIOC-B890: Seminar (1 cr., students must complete 4 semesters of B890 before they may advance to candidacy)

Biochemistry Major Electives

Students must take at least two of the eight 2-credit Biochemistry "core" courses (GRDM-G805, GRDM-G807, BIOC-B811, GRDM-G817, GRDM-G825, GRDM-G826, GRDM-G828, GRDM-G848, GRDM-G852,) shown below.

These classes are usually taken during the spring term of year one, year 2, or occasionally during year 3.

- GRDM-G 805 Diabetes and Obesity (2 cr.)
- GRDM-G 807 Structural and Chemical Biology (2 cr.)
- GRDM-G 817 Molecular Basis of Cell Structure and Function (2 cr.)
- GRDM-G 825 Advanced Topics in Molecular Biology (2 cr.)
- GRDM-G826 Heterologous of Production of Proteins and Small Molecules (2 cr.)
- GRDM-G 828 Concepts in Biotechnology
- GRDM-G 848 Bioinformatics, Genomics, Proteomics and Systems Biology (2 cr.)
- GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)

General Electives

If approved by the graduate advisor students may also take independent of their major or minor, electives for their research program including 500+ level non-research courses in:

ANAT-* 500 to ANAT-* 899
BIOC-* 500 to BIOC-* 899
CANB-* 500 to CANB-* 899
GRDM-* 500 to GRDM-* 899
INFO-* 500 to INFO-* 899
MGEN-* 500 to MGEN-* 899
MICR-* 500 to MICR-* 899
MNEU-* 500 to MNEU-* 899

The following courses do not count towards the General Elective requirement: BIOC-B 855

Biochemistry and Molecular Biology Research Course
Student will take minimum 45 credits in research in the following courses:

- BIOC-B 855 Research

Years 2-5

During years 2 through 5, the student will take didactic courses as needed to fulfill either requirements for the biochemistry major or their chosen minor. The student will typically register for a total of 10 cr. hours each fall and spring, including 1 cr. hour of BIOC-B890 for four semesters. The student will advance to candidacy upon completion of all didactic coursework, having at least 30 total credits and successful defense of their thesis proposal.

Work will begin in the field of the candidate's thesis. Emphasis on ability to pursue research with relative independence and responsibility.

Notes:

- Students will be questioned on topics outside of their thesis work during the oral defense of their thesis proposal. Passing of this defense (with B/3.0 grade or better) will be required for advancement to candidacy.
- Students will present a seminar each semester while enrolled in B890 as well as attend all student and faculty seminars. Students enrolled in BIOC-G901 are encouraged to consider giving a research presentation in BIOC-B890, even though they are not enrolled in the course.
- After choosing a laboratory for thesis research, an advisory committee consisting of at least two Biochemistry and Molecular Biology faculty members and one external faculty member will be formed with the approval of the thesis advisor and departmental chairperson. Upon advancement to candidacy, a thesis research committee will be similarly formed that may consist of different faculty. The Research Committee must consist of at least three Biochemistry and Molecular Biology faculty members and one external faculty member.
- Students must score at least B- on each course and maintain at least a B average (3.0 minimal GPA).
- The minor representative will be selected from outside the student's major department.

Grades

A minimum grade point average of 3.0 (B) must be maintained in all non-research course work.

Advancement to Candidacy

BIOC-B803 Advanced Biochemistry is a course in grant writing which will culminate in the submission and oral defense of an "F31 NIH -style" fellowship proposal on the student's intended research topic.

Students meet at least once every six months with an advisory committee to review progress in course work. Continuation in the program depends upon satisfactory performance and progress in each phase of the program. The final examination in the series is an oral defense of a written research proposal, which constitutes the written examination.

Dissertation

A minimum of 45 credit hours in research, completed with a grade point average of 3.0 (B) or above. It is

expected that the dissertation will qualify for publication in a recognized journal.

Final Examination

Oral, covering dissertation, major, and minor coursework.

Ph.D. Minor in Diabetes and Obesity

A minimum of 12 credit hours beyond the requirements of the student's major Ph.D. program. The minor must include the following courses:

- GRDM-G 805 Diabetes and Obesity

If GRDM-G 805 has been taken to fulfill other requirements, it may be substituted by elective course(s) from the list below with the approval of the student's advisory committee.

The remainder of the Minor will be selected from the following courses:

- GRDM-G 700 TRANSLATING FOUNDATIONAL SCIENCE TO CONTEMPORARY KNOWLEDGE - METABOLIC NEXUS-HLTH & DIS, DEVELOP, DEGEN&REGEN, GENES-HEREDITY IN BIOM SCI; SHIELDS AND SWORDS, METABOLIC NEXUS-HLTH & DIS
- GRDM-G 640 EPITHELIAL CELL BIOLOGY
- GRDM-G 715 BIOMEDICAL SCIENCE I - BIOCHEMICAL BASIS OF BIOLOGICAL PROCESSES
- GRDM-G 716 BIOMEDICAL SCIENCE II - MOLECULAR BIOLOGY AND GENETICS
- GRDM-G 717 BIOMEDICAL SCIENCE III: CELLULAR BASIS OF SYSTEMS BIOLOGY
- GRDM-G 725 GENE TRANSFER APPROACHES TO CLINICAL AND BASIC RESEARCH (GENE THERAPY)
- GRDM-G 727 ANIMAL MODELS OF HUMAN DISEASE
- GRDM-G 728 FUNDAMENTALS OF INFECTION AND PATHOGENESIS
- GRDM-G 729 IMMUNOLOGY I - INTRODUCTION TO THE IMMUNE SYSTEM
- GRDM-G 740 TRANSLATIONAL SYSTEMS PHYSIOLOGY AND PHARMACOLOGY
- GRDM-G 745 FUNDAMENTALS OF INTRACELLULAR SIGNAL TRANSDUCTION
- GRDM-G 747 PRINCIPLES OF PHARMACOLOGY
- GRDM-G 748 PRINCIPLES OF TOXICOLOGY
- GRDM-G 751 ADVANCED CONCEPTS IN CYTOSOLIC AND NUCLEAR SIGNAL TRANSDUCTION
- GRDM-G 761 MOLECULAR AND CELLULAR PHYSIOLOGY OF ION TRANSPORT
- GRDM-G 788 NEXT GENERATION SEQUENCING
- GRDM-G 807 STRUCTURAL AND CHEMICAL BIOLOGY
- GRDM-G 817 MOLECULAR BASIS OF CELL STRUCTURE FUNCTION
- GRDM-G 825 ADVANCED TOPICS IN MOLECULAR BIOLOGY
- GRDM-G 826 SYNTHETIC BIOLOGY AND BIOLOGICS
- GRDM-G 848 BIOINFORMATICS, GENOMICS, PROTEOMICS, AND SYSTEMS BIOLOGY

- GRDM-G 852 CONCEPTS OF CANCER BIOLOGY: SIGNALING GONE AWRY
- GRDM-G 855 EXPERIMENTAL DESIGN AND RESEARCH BIOSTATISTICS
- MGEN-Q 580 BASIC HUMAN GENETICS
- MGEN-Q 612 MOLECULAR AND BIOCHEMICAL GENETICS
- MGEN-Q 620 HUMAN CYTOGENETICS
- MGEN-Q 630 POPULATION GENETICS
- MICR-J 807 CURRENT TOPICS IN IMMUNOLOGY
- MICR-J 829 CURRENT TOPICS IN MOLECULAR GENETICS OF MICROORGANISMS
- PHSL-F 782 PHYSIOLOGY AND PATHOPHYSIOLOGY OF LIPID RAFTS

The Minor program must be approved by the student's Advisory Committee, which will take into consideration the student's total didactic experience. In the case of combined M.D./Ph.D. students, the Committee may approve substitution of appropriate medical school courses. The minor representative on this Committee will be selected from outside the student's major department and must be a member of the Diabetes and Obesity Training Program.

More information is available on the Diabetes and Obesity Research Training Program at the [Center for Diabetes Research website](#)

Faculty Listing

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

BIOC-B 500 Introductory Biochemistry (3 cr.)P: C341 or equivalent. Structures of carbohydrates, proteins, lipids, and nucleic acids. Basic principles of enzyme catalysis, protein synthesis, intermediary metabolism, and nutrition.

BIOC-B 803 Advanced Biochemistry (arr-3 cr.) Tutorial instruction in biochemistry.

BIOC-B 810 Cellular Biochemistry and Regulation (3 cr.)P: Two semesters of organic chemistry; one semester of biochemistry. Mechanisms of signal transduction and the control of cellular function by hormones, growth factors, and other extracellular regulators.

BIOC-B 811 Advanced Intermediary Metabolism (1-3 cr.)P: B810. Tutorial instruction in specialized areas of metabolism.

BIOC-B 854 Introduction to Research (1 cr.)P: Two semesters of organic chemistry; two semesters of physical chemistry, one semester of biochemistry, or consent of instructors. Tutorial and laboratory instruction in biochemistry. Purpose is to introduce students in biochemistry to three different research programs.

BIOC-B 855 Research (arr cr.)

BIOC-B 890 Seminar (1 cr.)

GRDM-G 749 Introduction to Structural Biology (1 cr.)An introduction to structural biology including the fundamentals of macromolecular structure and interactions, methods used to determine three-

dimensional structures, the relationship between protein sequence and structure, and prediction and analysis of macromolecular structure.

GRDM-G 805 Diabetes and Obesity (2 cr.)P: One semester of biochemistry. Biochemistry, cell biology, molecular biology, genetics, immunology, and pathophysiology of diabetes and obesity. Topics include metabolic regulation, signal transduction, insulin resistance, insulin production, beta-cell function, animal models, complications, nutrition, prevention, and therapy.

GRDM-G 807 Structural and Chemical Biology (2 cr.)Fundamentals of structural and chemical biology focused on state-of-the-art approaches to inhibitor discovery, use of inhibitors in elucidating biological function, and computational and structural approaches to rational inhibitor design.

GRDM-G 817 Molecular Basis of Cell Structure and Function (2 cr.)Organization and function of subcellular structures. Intracellular coordination of cell activities, including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 825 Advanced Topics in Molecular Biology (2 cr.)The course will highlight selected topics adjusted each year to reflect the most current advancements in molecular biology and will include lectures and paper discussions on: chromatin structure and regulation; transcriptional control; RNA structure and processing; RNAi and miRNA; RNA decay; translational control and its integration in gene expression.

GRDM-G 826 Heterologous Production of Proteins and Small Molecules (2 cr.) This course will explore the cellular, molecular, and metabolic changes that must be introduced into model systems to allow both faithful expression and high abundance of both heterologous proteins and heterologous small molecules (synthetic biology).

GRDM-G 828 Concepts in Biotechnology (3 cr.)P: B500 or equivalent. Case studies exploring topics on the cutting edge of biotechnology and tutorials in biotechnology calculations.

GRDM-G 848 Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr.)Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which in turn have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival, and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G 865 Fundamental Molecular Biology (3 cr.)P: B800 or equivalent. Principles of molecular structure, function, and biosynthesis; core information regarding prokaryotic and eukaryotic gene continuity and metabolic coordination; introduction to multicellular

systems and problems. (Joint program: biochemistry, medical genetics, microbiology.)

GRDM-G 890 Methods in Molecular Biology and Pathology (3 cr.) P: G865 and/or J838, and consent of instructor. Basic principles and techniques in molecular biology and pathology. Particular emphasis will be on molecular techniques that can be used to study problems related to biochemistry and pathology.

GRDM-G 910 Advanced Molecular Biology Methods (3 cr.) P: G865 and/or G890 and consent of instructor. Advanced theory and techniques in molecular biology. The focus of the course will be on techniques related to manipulation of cloned DNA to study their expression, structure, and function.

GRDM-G 826 Heterologous Production of Proteins and Small Molecules (2 cr.) This course explores the cellular, molecular, and metabolic changes required to enable faithful expression and high abundance of heterologous proteins and heterologous small molecules (synthetic biology).

GRDM-G 828 Concepts in Biotechnology (3 cr.) P: B500 or equivalent. Case studies exploring topics on the cutting edge of biotechnology and tutorials in biotechnology calculations.

GRDM-G 865 Fundamental Molecular Biology (3 cr.) P: B800 or equivalent. Principles of molecular structure, function, and biosynthesis; core information regarding gene regulation and metabolic coordination; introduction to multicellular systems.

GRDM-G 890 Methods in Molecular Biology and Pathology (3 cr.) P: G865 and/or J838, and consent of instructor. Basic principles and techniques in molecular biology and pathology with emphasis on molecular techniques applied to biochemical and pathological problems.

GRDM-G 910 Advanced Molecular Biology Methods (3 cr.) P: G865 and/or G890 and consent of instructor. Advanced theory and techniques in molecular biology with focus on manipulation of cloned DNA to study gene expression, structure, and function.

Biomedical Engineering Informatics

Luddy School of Informatics, Computing & Engineering

School URL: luddy.indianapolis.iu.edu

School email: luddyIN@iu.edu

Curriculum

Courses

Degrees Offered

Ph.D. in Biomedical Engineering and Informatics

- Bioinformatics specialization
- Biomedical Engineering specialization
- Biomedical and Health Informatics specialization

Minor in Health Informatics

Ph.D. in Biomedical Engineering and Informatics

Program Description

The Luddy School of Informatics, Computing, and Engineering is the first of its kind in the country and was created as a place where innovative multidisciplinary programs could thrive, a program where students can apply the skills of information technology to a range of other fields. For current information and specific requirements, refer to luddy.indianapolis.iu.edu.

Combining expertise in biology, engineering, sensors, medicine, mathematics, and computing, our doctoral programs tackle complex health challenges and drive innovation in life sciences and health care.

This interdisciplinary field leverages biomedical data, modeling, and simulation to drive research, problem-solving, and informed decision-making—spanning molecular systems to population health. It plays a critical role in connecting basic science with clinical practice and translating research into real-world health solutions.

Admissions Requirements

Applicants must meet the following minimum requirements for admission:

- A bachelor's or master's degree from an accredited institution in a relevant field, such as engineering, computing, information technology, computer science, biology, biochemistry, bioinformatics, biotechnology, health sciences, mathematics, statistics, physics, or a related discipline
- A minimum cumulative GPA of 3.0 on a 4.0 scale
- Demonstrated technical preparation appropriate to the intended specialization

Program Requirements

The curriculum includes specializations in Bioinformatics, Biomedical and Health Informatics, and Biomedical Engineering; coursework in research methods and theory; and electives in related disciplines within and outside the School leading to a Ph.D. minor; and a dissertation. In addition, students are encouraged to pursue internships through elective courses or independent study opportunities. All Ph.D. candidates must meet with their academic or research advisor for course selection and plan of study.

Bioinformatics Specialization

A minimum of 90 credit hours are required for the degree. The 90 credit hours consist of the following:

Required Core Courses (12 credit hours):

- INFO-B 519 Introduction to Bioinformatics
- INFO-B 528 Computational Methods for Analyzing High-Throughput Biological Data
- INFO-B 556 Biological Database Management
- INFO-B 573 Programming for Science Informatics

Bioinformatics Electives (12 credit hours):

Choose four from the following list. Other pre-approved courses may also count.

- INFO-B 518 Applied Statistical Methods for Biomedical Informatics
- INFO-B 529 Machine Learning in Bioinformatics
- INFO-B 536 Computational Methods for Biomedical Informatics
- INFO-B 574 Next-Generation Sequencing Data Analysis
- INFO-B 585 Analytics of Biomedical Data
- INFO-B 636 Genomic Data Analytics and Precision Medicine
- INFO-B 646 Computational System Biology
- Choose one: INFO-B 605 Social Foundations of Informatics or INFO-B 627 Seminar in Bioinformatics

Minor (12 credit hours minimum)

The minor must be taken from outside bioinformatics from the list of [approved minors](#) in the [graduate bulletin](#) with the recommendation of their advisor. Appropriate minors include [Applied Data Science](#), Applied Statistics, Biostatistics, [Computer Science](#), Medical and Molecular Genetics, Population Health Analytics, and Translational Cancer Biology, among others. Minor requirements are set by the minor department or program.

Students may request approval for an individualized minor comprising 12 credit hours from two or more programs.

Research (54 credit hours)

Students must complete at least 48 credit hours of dissertation. Students may also complete a research-focused internship, independent study, or rotation with the approval of their research advisor

Dissertation (48-54 credit hours):

- INFO-I 890 Thesis Readings and Research

Experiential learning (0-6 credit hours):

- INFO-I 595 Professional Internship
- INFO-I 699 Independent Study
- INFO-I 790 Informatics Research Rotation

Qualifying Examination

Written Qualifying Exam: All students will take a written qualifying examination that covers the required core courses and bioinformatics electives. The examination will be set by a group of faculty who are familiar with the content of the courses. Examinations will be offered in August. Students who do not successfully complete the examination can retake the examination a second time.

Oral qualifying examination: The oral examination will take place after the student successfully passes the written examination. Students must pass both the written and oral examination before passing on to candidacy. Only two attempts to pass the oral examination will be allowed. The oral examination will be based on the student's response to the written examination and any material from the core courses.

Dissertation Proposal

This is an oral review that covers in-depth knowledge of the student's primary research area and dissertation proposal. The research proposal for dissertation must be approved by the student's research committee. That committee may have the same membership as the

advisory committee, or the students may choose different members. The advisor for the dissertation will be a faculty member in the Luddy School of Informatics, Computing, and Engineering in Indianapolis and an endorsed member of the graduate faculty. At least one the three members of the committee will be based outside the school. The student will defend the dissertation proposal at a public colloquium in the school. The review should be completed within one year after passing the Qualifying Examinations.

Areas of Specialization

Faculty research projects often involve representatives from several different research areas working together to develop innovative and even revolutionary new solutions. While students can expect to concentrate in particular areas, they are also expected to explore the broader significance of their work and ways that their expertise can be leveraged to solve problems outside of their own domains.

Areas of Research

Protein structure and function prediction, comparative genomics, structural genomics, fragment assembly in DNA sequencing, systems biology, models of evolution, molecular modeling, drug design, machine learning algorithms, biological database integration, data mining, and biomedical text mining.

Biomedical and Health Informatics Specialization

A minimum of 90 credit hours are required for the degree. The 90 credit hours will consist of the following:

Required Core Courses (30 credit hours):

- INFO-I 501 Introduction to Informatics
- INFO-B 505 Informatics Project Management
- INFO-B 518 Applied Statistical Methods for Biomedical Informatics
- INFO-B 530 Foundations of Health Informatics
- INFO-B 535 Clinical Information Systems
- INFO-I 575 Informatics Research Design
- INFO-B 581 Health Informatics Standards and Terminology
- INFO-B 585 Biomedical Analytics
- INFO-B 642 Clinical Decision Support Systems
- PBHL-B 652 Biostatistics for Public Health II

Ph.D. Specific Courses (12 credit hours):

- GRDM-G 660 Clinical Research Methods
- INFO-B 667 Seminar in Interprofessional Informatics
- INFO-B 668 Advanced Seminar in BioHealth Informatics
- INFO-I 699 Independent Study in Informatics
- INFO-I 790 Informatics Research Rotation

Electives (6 credit hour minimum):

Choose a minimum of 2 (maximum of 5) courses:

- INFO-B 512 Scientific and Clinical Data Management
- INFO-B 551 Independent Study
- INFO-B 513 The Design, Implementation, and Evaluation of Electronic Health Record System
- INFO-B 573 Programming for Science Informatics

- INFO-B 582 Health Information Exchange
- INFO-B 585 Biomedical Analytics
- INFO-B 605 Social Foundations of Informatics (summer)
- INFO-B 626 Human Factors Engineering for Health Informatics
- INFO-B 641 Business of Health Informatics
- INFO-B 643 Natural Language Processing for Biomedical Records and Reports
- INFO-B 644 Consumer Health Informatics
- INFO-H 541 Interaction Design Practice
- INFO-H 543 Interaction Design Methods
- Advisor approved courses

Minor (12 credit hours minimum)

All students will be required to have an appropriate minor outside or partially inside the school. Minors will be selected with the advisor's recommendation. The selected minor should be appropriate to the student's choice of subdiscipline within health informatics. Some appropriate minors include public health, dental informatics, cognitive psychology, communication sciences, biostatistics, and clinical research science. In all cases, the number of hours to be included in the minor will be consistent with the requirements of the unit granting the minor.

Dissertation (21–30 credit hours):

- INFO-I 890 Thesis Readings and Research

Qualifying Examination

Written qualifying examination: All students will take a written qualifying examination that covers the (1) core courses of the Master's in Health Informatics Program and (2) critical review of Health Informatics Research. The examination will be set by a group of faculty who are familiar with the content of the core courses. Examinations will be offered in August. Examinations must be completed by the beginning of the student's third year in the program, but can be completed before that time when the core courses are completed. Students who do not successfully complete the examination can retake the examination a second time.

Oral qualifying examination: The oral examination will take place after the student successfully passes the written exam. Students must pass both the written and oral exam before passing on to candidacy. Only two attempts to pass the oral examination will be allowed. The oral exam will be based on the student's response to the written exam and any material from the core courses.

Dissertation proposal

This is an oral exam that covers in-depth knowledge of the student's primary research area and dissertation proposal. The research proposal for dissertation must be approved by the student's research committee. That committee may have the same membership as the program committee, or the student may choose different members. The advisor for the dissertation will be a faculty member in the Luddy School in Indianapolis and a member of the graduate faculty. At least one of the three members of the committee will be based outside the school. The student will defend the thesis proposal at a public colloquium in the school. The examination should be completed within

one year after passing the Qualifying Examinations. Only two attempts to pass this examination will be allowed.

Areas of Specialization

Faculty research projects often involve representatives from several different research areas working together to develop innovative and even revolutionary new solutions. While students can expect to concentrate in particular areas, they will also be expected to explore the broader significance of their work and ways that their expertise can be leveraged to solve problems outside of their own domains.

Areas of Research

Electronic medical records, health data exchange, standards and terminology for health data, clinical decision support, consumer health informatics, technology to enhance patient safety, health application development and implementation, cost reimbursement and integrated health information systems. The program collaborates with other health-focused institutions such as the IU Schools of Medicine, Nursing and Dentistry, the Regenstrief Institute and the VA Medical Center's Health Information and Communication Center.

Biomedical Engineering Specialization

A minimum of 90 credit hours are required for the degree. The 90 credit hours consist of the following:

Required Core Courses (12 credit hours):

- BMEG-E 501 Biomedical Engineering (3 cr.)
- BMEG-E 503 Biomedical Ethics and Regulation (3 cr.)
- Applied Mathematics in Engineering: (select one, 3 cr.)
 - INFO-B 518 Applied Statistical Methods for Biomedical Informatics (3 cr.)
 - DSCI-D 510 Statistics for Data Science (3 cr.)
 - MATH-I 514 Numerical Analysis (3 cr.)
 - MATH-I 537 Applied Mathematics for Scientists and Engineers I (3 cr.)
 - PBHL-B 571 Biostatistics Method I: Linear Models in Public Health (3 cr.)
 - PBHL-P551 Biostatistics for Public Health I (3 cr.)
 - PSY-I 600 Statistical Inference (3 cr.)
 - STAT-I 524 Applied Multivariate Analysis (3 cr.)
- Research Design: (select one, 3 cr.)
 - INFO-I 575 Informatics Research Design (3 cr.)
 - LIS-S 506 Introduction to Research (3 cr.)
 - PSY-I 601 Correlation and Experimental Design (3 cr.)

Biomedical Engineering focus area electives (12 credit hours):

Choose four:

- Computational Biomedical Engineering
 - BMEG-E 510 Artificial Intelligence in Biomedical Engineering (3 cr.)
 - BMEG-E 511 Biomedical Image Processing (3 cr.)

- BMEG-E 512 Digital Health Technologies (3 cr.)
- ENGR-E 540 Computational Methods for 3-D Biomaterials (3 cr.)
- ENGR-E 542 Introduction to Computational Bioengineering (3 cr.)
- ENGR-E 543 Computational Modeling Methods for Virtual Tissues (3 cr.)
- MATH-I 555 Introduction to Biomathematics (3 cr.)
- Biomedical Devices and Nanosystems
 - BMEG-E 502 Rapid Prototyping for Biomedical Engineering (3 cr., ENGR-E 537)
 - BMEG-E 520 Bionanosystems Principles (3 cr.)
 - BMEG-E 521 Bionanosystems Processes and Devices (3 cr., including lab)
 - BMEG-E 572 Biomedical Devices and Sensors (3 cr., ENGR-E 572)
 - CHEM-I 623 Sensors and Biosensors (3 cr.)
 - ENGR-E 505 Introduction to Nano-Engineering (3 cr.)
 - ENGR-E 571 Microfluidic Devices and Systems (3 cr.)
 - PHYS-I 530 Electricity and Magnetism (3 cr.)
- Biomedical Cell Engineering
 - BIOL-I 507 Principles of Molecular Biology (3 cr.)
 - BIOL-I 512 Advanced Cell Biology (3 cr.)
 - BIOL-I 516 Molecular Biology of Cancer (3 cr.)
 - BIOL-I 564 Molecular Genetics of Development (3 cr.)
 - BIOL-I 573 Stem Cell Biology (3 cr.)
 - CHEM-I 635 Protein Structure and Function (3 cr.)
 - PHYS-I 585 Introduction to Molecular Biophysics (3 cr.)
- Biomedical Tissue Engineering
 - BMEG-E 540 Bioprocess and Tissue Engineering (3 cr.)
 - BIOL-I 556 Physiology (3 cr.)
 - BIOL-I 569 Regenerative Biology and Medicine (3 cr.)
 - CHEM-I 673 Biomaterials (3 cr.)
 - CHEM-I 674 Biomimetics (3 cr.)
 - ENGR-E 570 Advanced Bioengineering (3 cr.)
- Drug and Device Fidelity, Assurance, and Clinical Translations
 - CHEM-I 696 Special Topics in Chemistry. Solid-Phase Synthesis and Combinatorial Chemistry: Theory and Practice (1–3 cr.)
 - COMM-C 533 Improvisation for Scientists (1 cr.)
 - GRDM-G 661 Clinical Trials (3 cr.)
 - GRMD-G 506 Responsible Conduct of Translational Research (1 cr.)
 - PBHL-B 582 Introduction to Clinical Trials (3 cr.)
- Other courses

- BMEG-E 690 Topics in Biomedical Engineering (1–3 cr.).
- Advisor approved courses

Minor (12 credit hours minimum)

Students select a Ph.D. minor with the recommendation of their advisor to add breadth and value to their degree. The minor must be taken from outside their program from the list of [approved minors](#) in the [graduate bulletin](#). Appropriate minors include [Applied Data Science](#), Applied Statistics, [Bioinformatics](#), Biostatistics, [Computer Science](#), [Health Informatics](#), Medical and Molecular Genetics, Population Health Analytics, Therapeutic Development and Translation, and Translational Cancer Biology, among others. Minor requirements are set by the minor department or program.

Students may request approval for an individualized minor comprising 12 credit hours from two or more programs. Students must obtain approval from the Dean of the Graduate School on the recommendation of their advisory committee before taking any of the courses.

The minor must be 12 credit hours. Courses counted toward a minor cannot also be counted toward the degree.

Research (54 credit hours)

Students must complete at least 48 credit hours of dissertation. Students may also complete a research-focused internship, independent study, or rotation with the approval of their research advisor

Dissertation (48-54 credit hours):

- BUKD-W 525 Entrepreneurship: Theory, Process, and Practice (3 cr.)
- BMEG-E 692 Project in Biomedical Engineering (1–6 cr.)
- INFO-B 638 Seminars in Biomedical Engineering and Informatics (3 cr.)
- INFO-I 595 Professional Internship (1–6 cr.)
- INFO-I 699 Independent Study in Informatics (1–6 cr.)
- INFO-I 790 Informatics Research Rotation (1–6 cr.)

All students must pass a written and an oral qualifying examination, offered in August.

Written qualifying exam: Students prepare a document in the format of an NIH F31 or NSF GRFP research proposal. This includes (1) a summary of the current state of the art in the chosen research area; (2) identification and critical analysis of gaps in the existing literature; and (3) a clearly defined research strategy presenting an original idea with specific aims and a testable hypothesis. This component demonstrates the candidate's ability to synthesize existing knowledge and design a meaningful research plan. The written examination is evaluated by the examination committee. Students who do not successfully complete the examination may retake it once.

Oral qualifying exam: An oral examination follows successful completion of the written examination. Students present their proposal to the examination committee, highlighting (1) the background and significance of the research topic; (2) critical analysis of selected literature; and (3) the proposed research approach and its

potential impact. After the presentation, the examination committee conducts a question-and-answer session on the proposal and relevant foundational knowledge from coursework. This portion assesses the candidate's depth of understanding, clarity of communication, and readiness for independent research. Only two attempts to pass the oral examination are allowed. Students must pass both the written and oral examinations to advance to candidacy.

This is an oral review that covers in-depth knowledge of the students' primary research area and dissertation proposal. The research proposal for the dissertation must be approved by the students' research committee. That committee may have the same membership as the advisory committee, or the students may choose different members. The dissertation advisor must be a faculty member in the Luddy School of Informatics, Computing, and Engineering in Indianapolis and an endorsed member of the graduate faculty. At least one of the committee's three members must be from outside the school. Students will defend their dissertation proposal at a public colloquium in the school. The review should be completed within one year after passing the qualifying examinations.

Ph.D. Minors

Ph.D. Minor in Bioinformatics

This minor equips students to apply computational tools to complex biological questions. Through coursework in bioinformatics, machine learning, biological databases, and high-throughput data analysis, students gain the skills to manage, analyze, and interpret large-scale biological data for advanced research across disciplines.

The Ph.D. minor in Bioinformatics is a 12-credit hour program comprised of four (4) courses each of which is 3 credit hours.

Required course:

- Required
 - INFO-B 519 Introduction to Bioinformatics
- Specialization courses (choose three):
 - INFO-B 528 COMPUTATIONAL ANALYSIS OF HIGH-THROUGHPUT BIOMEDICAL DATA
 - INFO-B 529 MACHINE LEARNING BIOINFORMATICS
 - INFO-B 556 BIOLOGICAL DATABASE MANAGEMENT
 - INFO-B 573 PROGRAMMING FOR SCIENCE INFORMATICS
 - INFO-I 590 Topics in Informatics - Next Generation Sequencing
 - INFO-B 646 COMPUTATIONAL SYSTEMS BIOLOGY
 - Select both for 3 credits:
 - GRDM-G 848 Bioinformatics, Genomics, Proteomics, and Systems Biology (enroll in 2 credits)
 - INFO-B 552 Independent Study in Bioinformatics (enroll in 1 credit)

Admission Requirements

The graduate bioinformatics courses in the Luddy School of Informatics, Computing and Engineering assume a minimal knowledge of cell and molecular biology. That level of understanding could be gained with at least 6 undergraduate credit hours in molecular biology, genetics, or evolution. They also assume a minimal knowledge of programming, databases, and statistics. That level of understanding could be gained with 3 to 9 credit hours of undergraduate or graduate courses in these areas.

Ph.D. Minor in Health Informatics

The purpose of the minor is to provide opportunities for current Indiana University doctoral students in other disciplines at IU to learn and use Health and Biomedical Informatics approaches to solve problems that arise in their academic fields. This program serves the needs of the Schools of Dentistry, Nursing, Medicine, Public Health, and Science by providing data and information science knowledge and skills in support of problem-solving across multiple health-related domains.

The Ph.D. minor in Health and Biomedical Informatics requires coursework totaling 12 credit hour program comprising four 3-credit hour courses.

These must include the following core courses:

- INFO-B 530 FOUNDATIONS OF HEALTH INFORMATICS
- INFO-B 535 CLINICAL INFORMATION SYSTEMS
- INFO-B 581 HEALTH INFORMATICS STANDARDS AND TERMINOLOGIES
- INFO-B 642 CLINICAL DECISION SUPPORT SYSTEMS

Admission Requirements

Applicants are required to have background in Information Technology and Healthcare (or the equivalent).

Grading Policy for all Ph.D. minors

A minimum of B (3.0) is required in each course that is to count toward the minor. If a minimum of B (3.0) is not earned in a course, that course must be retaken. A course may only be retaken once. Students who fail to achieve the minimum grade of B (3.0) the second time they take a course will not be able to earn the Ph.D. minor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

BMEG-E 501 BIOMEDICAL ENGINEERING (3 cr.)

This course explores the intersection of engineering, biology, and medicine. Topics include bioinstrumentation, biomanufacturing, drug delivery, cellular and molecular bioengineering, biomaterials, human physiology and biomechanics, AI in healthcare, genomics, and tissue engineering.

BMEG-E 502 RAPID PROT & DEVICE FAB IN BME (3 cr.)

This course covers rapid prototyping techniques in biomedical engineering, emphasizing hands-on design, modeling, and fabrication of biomedical devices. Students explore applications in implants, drug delivery, robotics,

and diagnostic tools, gaining skills in 3D printing, material selection, and testing to develop innovative healthcare solutions for real-world challenges.

BMEG-E 503 BIOMEDICAL ETHICS & REGULATION (3 cr.) This course covers management, economic, policy, and ethical issues in pharmaceutical, biotechnology, and medical device industries. Topics include R&D regulations, FDA approval, mergers, liability, and ethics in drug delivery, health technology, bio-nanotechnology, tissue engineering, and implants. Students examine industry challenges, regulations, and how decisions impact innovation and public health.

BMEG-E 510 AI IN BIOMEDICAL ENGINEERING (3 cr.) This course covers artificial intelligence principles in biomedical engineering, focusing on machine learning, deep learning, and advanced models in healthcare applications. Students examine foundational models, biomedical data types (tabular, text, imaging, genomics), data curation, feature extraction, and statistical analysis, with discussions on foundation models, large language models, and ethical implications.

BMEG-E 511 BIOMEDICAL IMAGE PROCESSING (3 cr.) This course covers biomedical image processing principles and applications, including image analysis, enhancement, segmentation, registration, and 3D reconstruction. Advanced methods like machine learning are introduced to address modern challenges. Hands-on exercises reinforce skills, enabling students to apply image processing techniques in clinical and research contexts for biomedical imaging.

BMEG-E 512 DIGITAL HEALTH TECHNOLOGIES (3 cr.) This course covers principles of human physiology and digital health innovations integrating AI, wearable devices, big data, and mobile platforms. Students capture, analyze, and use physiological data for personalized medicine, remote monitoring, and diagnostics. They engage in projects applying IoT and data-driven approaches to improve healthcare delivery and outcomes.

BMEG-E 520 BIONANOSYSTEMS PRINCIPLES (3 cr.) This course covers the theoretical foundations of bionanosystems, introducing nanoscale phenomena, such as quantum processes and advanced materials. Students explore tools for measuring and characterizing nanoscale structures and processes, including single-molecule imaging and spectroscopy techniques. The course emphasizes principles driving innovations in precision medicine, drug delivery, nanorobotics, and sustainable nanotechnology.

BMEG-E 521 BIONANOSYSTEMS PROCS & DEVICES (3 cr.) This course covers the design, development, and integration of devices within bionanosystems, bridging nanoscale materials with micro-, meso-, and macroscale components. Students explore electronic, electromechanical, and biomedical devices, including nanodevices and nanobiosensors, using AI-driven modeling, optimization, and data analysis tools. Applications include precision sensing, advanced diagnostics, and next-generation medical technologies.

BMEG-E 540 BIOPROCESS TISSUE ENGINEERING (3 cr.) This course explores bioprocessing and tissue engineering, including cell culture, bioreactors, scale-up strategies, scaffold fabrication, and regenerative medicine.

Students gain experience in cell culture, bioreactor setup, and scaffold design, focusing on clinical and commercial translation. The course integrates biological, engineering, and industrial concepts to advance biomanufacturing and tissue engineering applications.

BMEG-E 571 MICROFLUIDIC DEVICES & SYSTEMS (3 cr.) This course covers analysis of microscale transport, including electrokinetics, non-Newtonian flow, and multiphase dynamics. Students engage in a critical review of current literature and rigorous physics-based modeling. The course focuses on innovation, requiring students to develop and defend an original research proposal for novel microphysiological systems.

BMEG-E 572 BIOMEDICAL DEVICES AND SENSORS (3 cr.) This course covers nano/micro design and fabrication, actuators, sensors, microfluidics, implanted devices, lab-on-a-chip devices, drug delivery systems, detection and measurement systems, and their biomedical applications relevant for clinical medicine, food safety, environmental health, and homeland security. The discussions and projects are designed to address practical problems with engineering solutions.

BMEG-E 690 TOPICS BIOMEDICAL ENGINEERING (1-3 cr.) This course explores advanced topics in biomedical engineering, integrating research and applications. Students analyze biomedical signals, develop devices, and evaluate ethical and regulatory challenges. Emphasis is on interdisciplinary problem-solving and healthcare solutions. Through projects and discussions, students gain expertise to address global challenges in biomedical engineering.

BMEG-E 691 THESIS BIOMEDICAL ENGINEERING (1-6 cr.) This course enables students to apply advanced biomedical engineering skills to a thesis. Students design, develop, and test solutions to real-world problems, culminating in a report and presentation. Theses may involve industry collaboration or faculty mentorship, emphasizing research and innovation.

BMEG-E 692 PROJECT BIOMEDICAL ENGINEERING (1-6 cr.) This course enables students to apply advanced biomedical engineering skills to a project. Students design, develop, and test solutions to real-world problems, culminating in a report and presentation. Projects may involve industry collaboration or faculty mentorship, emphasizing innovation and professional practices.

INFO-I 501 Introduction to Informatics (3 cr.)

P: Graduate standing. Basic information representation and processing; searching and organization; evaluation and analysis of information. Internet-based information access tools; ethics and economics of information sharing.

INFO-B 505 Informatics Project Management (3 cr.)

This is a professional introduction to informatics project management and organizational implementation of integrated information solutions. The target audience is informatics project team members likely to pursue informatics project manager roles as well as all members not likely to do so. Through reading, lecture, discussion, practice, and targeted projects, students gain historical perspectives, current awareness, and proficiency with informatics project management terminology, techniques, and technologies.

INFO-B 506 Biomedical Informatics (3 cr.) The course covers the latest biomedical informatics concepts, technologies, policies, and skills, including infrastructure and data management, image analytics, visualization, and API design and implementation for healthcare. Students analyze healthcare and biomedical information, infer the outcomes of data processing and analysis, and master the tools required for biomedical data analytics.

INFO-B 512 Scientific and Clinical Data Management (3 cr.) Management and mining of data generated in scientific laboratories and clinical trials for data mining and knowledge discovery requires robust solutions that include knowledge discovery techniques and databases, extraction of data/metadata stored in data warehouses that use Storage area Networks and dealing with security issues of handling this data.

INFO-B 513 The Design, Implementation, and Evaluation of Electronic Health Record Systems (3 cr.) Students analyze the design of existing EHR systems through the example of an open-source platform, OpenMRS. They implement this platform according to international conceptual and markup standards, such as the Health Level 7 Reference Information Model (HL7 RIM) and the Continuity of Care Document (CCD). Students evaluate gaps in the system by comparing it with other Computerized Physician Order Entry (CPOE) systems and create designs for modules. Students evaluate legal, ethical, and regulatory implications of current EHR systems.

INFO-H 515 Introduction to Data Analytics (3 cr.) This course applies statistical learning methods for data mining and inferential and predictive analytics to informatics-related fields. The course also introduces techniques for exploring and visualizing data, assessing model accuracy, and weighing the merits of different methods for a given real-world application. This course provides an essential toolset for transforming large, complex informatics datasets into actionable knowledge.

INFO-H 516 Applied Cloud Computing for Data Intensive Sciences (3 cr.) This course covers data science concepts, techniques, and tools to support big data analytics, including cloud computing, parallel algorithms, nonrelational databases, and high-level language support. The course applies the MapReduce programming model and virtual-machine utility computing environments to data-driven discovery and scalable data processing for scientific applications.

INFO-H 517 Visualization Design, Analysis, and Evaluation (3 cr.) This is an introductory course in design and evaluation of interactive visualizations for data analysis. Topics include human visual perception, visualization design, interaction techniques, and evaluation methods. Students develop projects to create their own web-based visualizations and develop competence to undertake independent research in visualization and visual analytics.

INFO-B 518 Applied Statistical Methods for Biomedical Informatics (3 cr.) The ability to understand, analyze, and interpret biomedical data is integral to biomedicine. This course provides in-demand data analysis skills and hands-on experience in analyzing genomic, proteomic, and health data. Students solve cutting-edge biomedical

problems by applying statistical methods, packages, and toolkits.

INFO-B 519 Introduction to Bioinformatics (3 cr.) Sequence alignment and assembly; RNA structure, protein and molecular modeling; genomics and proteomics; gene prediction.

INFO-B 528 Computational Analysis of High-throughput Biomedical Data (3 cr.) This course covers advanced concepts of genomics, molecular biology, and systems biology and explores computational methods for analyzing their high-throughput datasets. Problems in biology and biomedicine will motivate the development of algorithms to apply to these datasets.

INFO-B 529 Machine Learning for Bioinformatics (3 cr.) P: I519. The course covers advanced topics in bioinformatics with a focus on machine learning. The course will review existing techniques such as hidden Markov models, artificial neural network, decision trees, stochastic grammars, and kernel methods. Examine application of these techniques to current bioinformatics problems including: genome annotation and comparison, gene finding, RNA secondary structure prediction, protein structure prediction, gene expression analysis, proteomics, and integrative functional genomics.

INFO-B 530 Foundations of Health Informatics (3 cr.) This course will introduce the foundations of health informatics. It will review how information sciences and computer technology can be applied to enhance research and practice in healthcare. The basic principles of informatics that govern communication systems, clinical decision, information retrieval, telemedicine, bioinformatics and evidence-based medicine will be explored.

INFO-B 531 Seminar in BioHealth Informatics (1–3 cr.) Presentation and discussion of new topics in health informatics as seminar by students. Concentration on a particular area each semester to be announced before registration.

INFO-B 535 Clinical Information Systems (3 cr.) Clinical Information Systems includes: human computer interface and systems design; healthcare decision support and clinical guidelines; system selection; organizational issues in system integration; project management for information technology change; system evaluation; regulatory policies; impact of the Internet; economic impacts of e-health; distributed healthcare information technologies and future trends.

INFO-B 536 Computational Methods for Biomedical Informatics (3 cr.) This course covers algorithm design, algorithm analysis, and complexity analysis and their applications in biomedical informatics.

INFO-B537 Health Literacy (3 cr.) This course examines health literacy, its role in a multicultural society, and its impact on patient care. Students learn how to increase health literacy so that patients better understand their health issues. The course also examines communication problems between healthcare providers and patients and how to improve health communication.

INFO-B 551 Independent Study in Health Informatics (1–3 cr.) Independent study under the direction of a faculty member, culminating in a written report. Total credit

for seminars and independent study courses may not exceed nine hours. May be repeated for credit.

INFO-B 552 Independent Study in Bioinformatics (1–3 cr.) Independent study under the direction of a faculty member, culminating in a written report. Total credit for seminars and independent study courses may not exceed nine hours. May be repeated for credit.

INFO-B 556 Biological Database Management (3 cr.) Study about database management and its application to bioinformatics. Topics include data modeling, data indexing and query optimization with a bioinformatics perspective, and database issues in complex nature of bioinformatics data. The course also involves study of current challenges related to bioinformatics data management, data integration and semantic Web.

INFO-B 573 Programming for Science Informatics (3 cr.) Students will receive a thorough understanding of software development for chemical informatics and bioinformatics, and broaden experience of working in a scientific computing group. Topics include programming for the web, depiction of chemical and biological structures in 2D and 3D, science informatics tool kits, software APIs, AI and machine-learning algorithm development, high performance computing, database management, managing a small software development group, and design and usability of science informatics software.

INFO-B 574 Next-Generation Sequencing Data Analysis (3 cr.) This course covers concepts of genomic sequencing datasets from several sequencing platforms, including how the data motivates computational needs and tasks for analysis. Students learn how to devise approaches for analyzing massive clinical and biomedical sequencing datasets and for developing sound hypotheses and making predictions.

INFO-I 575 Informatics Research Design (3 cr.) Introduction and overview to the spectrum of research in informatics. Qualitative and quantitative research paradigms, deterministic experimental designs to a posteriori discovery. Issues in informatics research; conceptual, design, empirical, analytical, and disseminative phases of research.

INFO-B 581 Health Informatics Standards and Terminologies (3 cr.) Health information standards specify representation of health information for the purpose of communication between information systems. Standards not only standardize data formats, but also the conceptualizations underlying the data structures. The design process of data standards, domain analysis, conceptualization, modeling, and the methods and tools commonly used are explored.

INFO-B 582 Health Information Exchange (3 cr.) This course describes the drivers and challenges, the data and services of electronic health information exchange (HIE). The five focus areas of HIE are reviewed relative to strategies and actions: Aligning incentives; Engaging Consumers; Improving Population Health; Managing Privacy, Security and Confidentiality; and, Transforming Care Delivery.

INFO-B 583 Security and Privacy Policies and Regulations for Health Care (3 cr.) This course discusses privacy and security regulations for health care

information transactions including policy, procedures, guidelines, security architectures, risk assessments, disaster recovery, and business continuity. Particular attention is given to the Health Insurance Portability and Accountability Act (HIPAA) and the Health Information Technology for Economic and Clinical (HITECH) Act.

INFO-B 584 Practicum in Health Information Technology (3 cr.) This course provides an opportunity for the learner to synthesize all previous coursework and to demonstrate beginning competency in Health Information Technology (HIT) applications. The course employs an application focus in which the learner demonstrates comprehension, critical thinking, and problem-solving abilities within the context of a real-world environment.

INFO-B 585 Biomedical Analytics (3 cr.) This course introduces the use of patient data, genomic databases, and electronic health records (EHR) to improve patient care and to achieve greater efficiencies in public and private healthcare systems. The course explores clinical intelligence and the role of analytics in supporting a data-driven learning healthcare system.

INFO-I 590 Topics in Informatics (1–3 cr.) Variable topic. Emphasis is on new developments and research in informatics. Can be repeated with different topics, subject to approval of the Dean.

INFO-I 595 Professional Internship (1-6 cr.) An experiential learning course where students apply classroom theory and learning in degree-related work experience under the supervision of a mentoring supervisor and course instructor.

INFO-I 600 Professionalism and Pedagogy in Informatics (3 cr.) Course will introduce students to topics and skills necessary for entering careers in industry or the academy. Topics covered will include career planning, curriculum development, effective teaching, research ethics, scholarly and trade publishing, grantsmanship, and intellectual property consideration.

INFO-B 605 Social Foundations of Informatics (3 cr.) Topics include the economics of information businesses and information societies, legal and regulatory factors that shape information and information technology use, the relationship between organization cultures and their use of information and information technology, and ownership of intellectual property.

INFO-B 621 Computational Techniques in Comparative Genomics (3 cr.) Course will summarize computational techniques for comparing genomes on the DNA and protein sequence levels. Topics include state of the art computational techniques and their applications: understanding of hereditary diseases and cancer, genetic mobile elements, genome rearrangements, genome evolution, and the identification of potential drug targets in microbial genomes.

INFO-B 626 Human Factors Engineering for Health Informatics (3 cr.) In this course, students review and critique traditional and emerging human factors engineering approaches, concepts, and methods and apply them to contemporary health informatics problems. Class activities include discussions and interactive peer

review of articles, presentations, and original research proposals.

INFO-B 627 Advanced Seminar I – Bioinformatics (3 cr.) P: Advanced graduate standing or consent of instructor. Introduces students to major historical, contemporary, and emerging theories, methods, techniques, technologies and applications in the field of bioinformatics. Student will explore relevant and influential research, results and applications. Students will develop an understanding of leading research approaches and paradigms, and will design an independent research program in relation to their individual research fields and personal interests. The course will focus on research approaches in bioinformatics, and emerging technologies in biology and chemistry, and basic computational techniques.

INFO-B 637 Advanced Seminar II – Bioinformatics (3 cr.) P: Advanced graduate standing or consent of instructor. Introduces students to major historical contemporary and emerging theories, methods, and techniques in the field of Bioinformatics. Students will examine and explore relevant and influential research, results and applications. Students will develop an understanding of leading research approaches and paradigms, and will design an independent research program in relation to their individual research fields and personal interests. The course will focus on research approaches in bioinformatics, emerging technologies in biology and chemistry, and basic computational techniques.

INFO-B 641 Business of Health Informatics (3 cr.) This class focuses on the economic importance of healthcare information technology adoption for value realization, as a strategic asset, as an investment, and transformation toward integrated decision making. Topics covered include but are not limited to implementation of Decision Support System, barcode tracking, Electronic Health Records, pay-for-performance, incentives for e-prescribing.

INFO-B 642 Clinical Decisions Support Systems (3 cr.) This course provides an overview of the background and state-of-the-art Clinical Decision Support Systems (CDSS). Topics include: the design principles behind clinical decision support systems, mathematical foundations of the knowledge-based systems and pattern recognition systems, clinical vocabularies, legal and ethical issues, patient centered clinical decision support systems, and the applications of clinical decision support systems in clinical practice.

INFO-B 646 Computational Systems Biology (3 cr.) Introduction on how Omics data are generated, managed, analyzed from large-scale computational perspectives, exploring computational resources, especially biological pathways for integrative mining and computational analysis, representing and modeling multi-scale biological networks, relating static/dynamic properties to the understanding phenotypic functions at the molecular systems level.

INFO-B 656 Translational Bioinformatics Applications (3 cr.) This course entails a cohesive approach to the theory and practice of bioinformatics applications in translational medicine [TM]. It includes topics related to the complexities of low, medium and high-throughput applications in TM and powerful solutions to TM data

management problems by employing various informatics frameworks.

INFO-B 668 Seminar in BioHealth Informatics (1 cr.) This course provides graduate students with knowledge on a wide range of current topics in health informatics from faculty and professionals engaged in cutting edge research and practice. Students connect with innovative faculty while learning through a combination of lectures, practicums, and discussions. The topics and presenters will be different each semester.

INFO-B 691 Thesis/Project in Health Informatics (1–6 cr.) The student prepares and presents a thesis or project in an area of health informatics. The product is substantial, typically multi-chapter paper or carefully designed and evaluated application, based on well-planned research of scholarly project. Details are worked out between the student and the sponsoring faculty member. May be repeated for credit.

INFO-B 692 Thesis/Project in Bioinformatics (1–6 cr.) The student prepares and presents thesis or project in an area of bioinformatics. The product is substantial, typically a multi-chapter paper or carefully designed and evaluated application, based on well-planned research or scholarly project. Details are worked out between student and sponsoring faculty member. May be repeated for credit.

INFO-B 698/INFO-I 698 Research in Informatics (1–12 cr.) Research under the direction of a member of the graduate faculty that is not dissertation related. Can be repeated for credit for a total of 30 credit hours.

INFO-I 699 Independent Study in Informatics (1–3 cr.) Independent readings and research for Ph.D. students under the direction of a faculty member, culminating in written report. May be repeated for a maximum of 12 credit hours.

INFO-I 790 Informatics Research Rotation (3 cr.) Work with faculty, investigate research opportunities. Can be repeated for a maximum of 6 credit hours.

INFO-I 890 Thesis Readings and Research (1–12 cr.) Research under the direction of a member of the graduate faculty leading to a Ph.D. dissertation. Can be repeated for credit for a total of 30 credit hours.

INFO-B 667 Seminar in Interprofessional Collaboration (1–3 cr.) This seminar provides graduate students with in depth experiences in interprofessional thinking and collaboration when implementing informatics applications. Biohealth Informatics applications are developed an interprofessional learning laboratory rooted in real-life innovation, discovery, and collaboration related to health and wellbeing.

Biomedical Sciences

School of Medicine

Departmental E-mail: gradium@iu.edu

Departmental URL: medicine.iu.edu/graduate-degrees/phd/indianapolis

Curriculum

Programs Offered

- IU School of Medicine Biomedical Gateway Program (doctoral admissions and gateway program)

- Policy Analysis for Biomedical Science PhD Minor

IU School of Medicine Biomedical Gateway (IBMG) Program

Overview

The Indiana University School of Medicine BioMedical Gateway (IBMG) Program for Ph.D. study is the first year of study in the PhD program at Indiana University. As part of the student's enrollment, the student will take part in research and course work as part of the IBMG Program and is considered full-time. The curriculum for this experience is built around foundational courses leading to a choice of modular electives that match the student's research interest, a variety of laboratory research experiences, and strong support and mentoring. The following programs participate in the IBMG Program:

- Anatomy, Cell Biology, and Physiology (Translational Biomedical Research Track)
- Biochemistry and Molecular Biology
- Medical and Molecular Genetics
- Medical Neuroscience
- Microbiology and Immunology
- Musculoskeletal Health
- Pharmacology
- Translational Cancer Biology

The IBMG Program serves as an open enrollment admissions program for our eight biomedical science doctoral programs. For more information on the application process and admissions criteria, contact the IBMG Program for PhD Study at biomed@iu.edu or find out more information at medicine.iu.edu/education/graduate-degrees/phd.

Admissions Requirements

Applicants to the PhD program must have relevant research experience. An example of a robust research experience would be a project outside of a class lasting six weeks or longer in which the applicant thinks about the project, asks questions, designs and conducts experiments, interprets data, and formally presents the results. PhD applicants are expected to have a strong background in the sciences; however, there are no formal course requirements for the Indiana BioMedical Gateway Program for PhD Study at IU School of Medicine. A bachelor's degree in the sciences is strongly recommended.

Program Requirements

As a first year IBMG Program student, students take a shared curriculum with core first semester components, core required courses in the second and third semester, and many options to focus your studies in the second semester. During this time, emphasis is placed on the advising and mentoring of all first year students. Faculty mentors are advised and strongly encouraged to document their participation in the NIH NRMN-based IUSM workshop "Unlocking Your Inner Mentor" or the program offered by the IU Indianapolis Mentoring Center.

At the end of the first year, laboratory assignments will be made and student will then join the biomedical science Ph.D. degree program of your choosing. **After the student chooses their program, they will then be**

responsible to complete the requirements for their chosen program. Students will then each conduct an individual research project and complete the requirements of their respective degree programs.

For more information on the courses that are available as part of the program, visit the IU School of Medicine website.

Policy Analysis for Biomedical Science PhD Minor

Overview

The doctoral minor in policy analysis for biomedical science is a 12-credit hour minor designed to provide Ph.D. students in the IU School of Medicine Graduate Division and any program throughout IU the opportunity to learn more about the fundamentals of policy analysis for those individuals pursuing a career in science policy (policy development, advocacy, and lobbying, for example). This program blends classroom learning opportunities offered by the IU O'Neill School of Public and Environmental Affairs and a practicum that allows students to integrate this knowledge with their scientific training into a science policy context.

Admissions

To be admitted to the Ph.D. minor in Policy Analysis for Biomedical Sciences, you must be a currently enrolled doctoral student in good academic standing in any IU or IU Indianapolis school.

Students who would like to apply to the Ph.D. minor in Policy Analysis for Biomedical Sciences must submit an email to the Associate Dean for Research and Graduate Studies, and contact for this minor, the following:

- Documentation of the approval of the student's pursuit of this minor by his/her PI and advisory committee
- A one-page personal statement explaining the student's reason for pursuing this minor, including the relevance of the minor to their program and goals

Accepted students will be notified promptly via email by the minor contact.

Course Requirements

Required courses/practicum (6 credits):

- SPEA-V 512 Public Policy Process 3 cr. (Fall only)
- SPEA-V 663 Policy Analysis 3 cr. (Spring, and maybe also Fall)

Elective courses (3 credits):

- SPEA-V 507 Data Analysis & Modeling 3 cr. (Spring only)
- SPEA V-510 Advocacy and Government Relations
- SPEA-V 562 Public Program Evaluation 3 cr. (Fall and Spring)

Required Practicum (3 credits total):

- GRDM-G792 – Practicum for Biomedical Sciences

A minimum of B (3.0) is required in each course that is to count toward the minor. If a minimum of B (3.0) is not earned in a course, that course must be retaken. A course

may be retaken only once. Students who fail to achieve the minimum grade of B (3.0) the second time they take a course, will not be able to earn this Ph.D. minor.

The Ph.D minor Policy Analysis for Biomedical Sciences does not require a Qualifying Exam.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

GRDM-G504 Introduction to Research Ethics (2-3 cr) Introduction to the basic concepts of research ethics. The course will cover the historical development of concern with ethics in science as well as practical information needed by students working in science today. Format will be lecture and discussion.

GRDM-G505 Responsible Conduct of Research (1 cr) The purpose of this course is to provide its students with a formal setting to learn about the basic rules and acceptable standards required for anyone conducting scientific research. It will help its students obtain knowledge and develop skills for dealing with potential ethical problems in the research laboratory on their own.

This course is designed for all beginning graduate students working in the life sciences or related fields and other researchers who require basic training in the responsible conduct of research.

GRDM-G506 Responsible Conduct of Translational Research (1 cr) This course provides an introduction to the responsible conduct of research (RCR), which the NIH defines as follows, "the practice of scientific investigation with integrity. It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research." While RCR is required for all types of research, this course focuses on issues that arise in relation to clinical and translational research, mostly involving human subjects. Completion of this course fulfills the NIH requirements for instruction in RCR for trainees and students.

GRDM-G507 Reagent Validation as a Means for Enhanced Research Reproducibility (1 cr) "Reagent Validation as a Means for Enhanced Research Reproducibility" is designed to provide training for pre-doctoral students in the area of appropriate reagent utilization by focusing on biological variables, with particular attention to murine models, and on biological and chemical resources, with particular attention to cell line authentication, plasmid verification, and antibody utilization. This course will entail a traditional didactic lecture series accompanied by relevant whole-class practical exercises allowing students to implement basic methods of reagent verification.

GRDM-G510 MD/PhD Special Options Course (0 cr) This course is being created for a group of MD/PhD students who are in the Biomedical Engineering program, through IUSOM and Purdue. This group of students must enroll at Purdue while maintaining their student status on the IU-Indianapolis campus, due to PI location.

GRDM-G700 Translating Foundational Science to Contemporary Knowledge (1 cr) G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then through discussion of an assigned paper from the primary literature.

GRDM-G702 Entering Biomedical Research (1 cr) Entering Biomedical Research is a mentee training curriculum designed to help first year graduate trainees develop the skills get the most from their mentored research experience. Through activities, case studies and discussion, mentees are introduced to important topics and concepts organized around five key areas of trainee development: research skills, interpersonal skills, psychosocial skills, professional development skills, and culturally focused skills.

GRDM-G709 Foundations of Stem Cells in Physiology, Pathophysiology, and Clinical Utilization (1 cr) GRDM-G709 is designed to introduce learners to the foundational concepts of the types, language, techniques, biology and clinical applications of all types of stem cells from embryonic to somatic.

GRDM-G715 Biomedical Science I: Biochemical Basis of Biological Processes (2 cr) One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G716 Biomedical Science II: Molecular Biology and Genetics (2 cr) Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G717 Biomedical Science III: Cellular Basis of Systems Biology (2 cr) Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G718 Research in Biomedical Sciences (2 cr) A laboratory research rotation course. Allows incoming basic science doctoral graduate students in the School of Medicine programs to take research rotation in laboratories affiliated with all of the School graduate programs.

GRDM-G720 Stem Cell Biology (2 cr) This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and

other external other external stimuli, and what their clinical capabilities are and might be.

GRDM-G724 Molecular Cancer Genetics (1 cr) An introduction to cancer focusing on genetics. Topics include causes and effects of chromosome instability (including centromere/telomere failures and chromosomal translocation), epigenetic changes and genetic risk factors during cancer progression.

GRDM-G725 Gene Transfer Approaches to Clinical and Basic Research (1 cr) A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.

GRDM-G727 Animal Models of Human Disease (1 cr) This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal of the course is to provide a framework for students to select experimental animal models in their future research careers.

GRDM-G728 Fundamental Concepts of Infection and Pathogenesis (1 cr) This course will cover concepts of host-pathogen interactions ranging from pathogen entry, growth and spread in the host to pathogen and mediated injury, immune evasion, pathogen survival strategies and transmission to new hosts. Basics of bacterial, viral and parasitic structures will be considered as they relate to pathogenesis.

GRDM-G729 Introduction to Immunological Systems (1 cr) An introductory biomedical science, lecture-based core course intended for all incoming basic science graduate doctoral students in the School of Medicine programs or other interested graduate students. The course will cover components of the immune system development of the immune system, the immune response to pathogens and immunological disease.

GRDM-G733 Introduction to Biological Microscopy (2 cr) Introduces key concepts and capabilities of modern biological microscopy, covering basic concepts that carry through all microscope imaging modalities and providing examples of how these concepts apply in the real world at the level of cellular and molecular imaging using transmitted light and fluorescence and in EM.

GRDM-G734 Advanced Molecular Imaging (2 cr) Introduces imaging methods and concepts used in molecular structure as dynamics analysis. The course emphasizes general principles of macromolecular structure and dynamics applied to ensemble and single molecules. Methodologies use visible light, electrons and atomic force mapping.

GRDM-G735 Cardiovascular, Renal, and Respiratory Function in Health and Disease (2 cr) The course will advance fundamental elements of cardiovascular function including basic hemodynamic cardiac function, respiratory function, ventilator mechanics, gas exchange and kidney function, including control of excretion and regulation

of body fluid dynamics. An emphasis will be placed on integrative function of different organ systems.

GRDM-G736 Endocrine and Gastrointestinal Function in Health and Disease (1 cr) The course emphasizes the use of modern experimental techniques to study mechanisms underlying the physiological function of the gastrointestinal tract and endocrine system. Lectures highlight the molecular and cellular basis for diseases of the gastrointestinal and endocrine systems and how they impact whole animal function.

GRDM-G737 Introduction to Histology (1 cr) This course is designed to introduce graduate students in the biomedical sciences to the microscopic structure of the tissues and organs of the body. It is the first unit of ANAT-D 851 Histology. Lectures will focus on the structural basis of normal physiology processes, with emphasis of the contribution of the basic tissues (epithelium, nerve, muscle, connective tissue) to simple organ systems (i.e. blood vessels and integument).

GRDM-G740 Translational Systems Physiology and Pharmacology (2 cr) This course is designed to teach students the basics of physiological systems and therapeutics used to target those systems for the management of known human diseases. Faculty will lecture on the assigned topic, and lead discussion within the class period.

GRDM-G743 Fundamentals of Electrical Signaling & Ion Channel Biology (2 cr) Experimental basis for cellular and molecular concepts of electrical excitability and membrane transportation through ion channels.

The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide current facts to memories.

GRDM-G744 Neuropharmacology of Synaptic Transmission: Receptors and Ligands. Experimental basis for current cellular and molecular concepts of postsynaptic receptors and signals involved in chemical synaptic transmission in the nervous system. The goals are to foster an understanding of how we accumulate information and to evaluate hypotheses and to define unanswered questions, rather than provide current "facts" to memorize.

GRDM-G745 Fundamentals of Intracellular Signal Transduction (2 cr) Experimental basis for cellular and molecular concepts of intracellular signaling cascades activated by multiple processes. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide "facts" to memorize.

GRDM-G746 Chromosome Instability and Disease (1 cr) Exploration of the mechanisms of chromosome instability and the clinical impact of this problem. Topics will include chromosome structure and function and how failures in these functions promote chromosome instability in meiosis and mitosis. Other topics include the clinical consequences of chromosome instability in miscarriage, birth defects, and cancer.

GRDM-G747 Principles of Pharmacology (1 cr) This course is intended for incoming, basic science

doctoral graduate students in the School of Medicine Pharmacology & Toxicology programs of other interested graduate students. This course covers the basic of drug receptor interactions, drug metabolism, pharmacokinetics, and pharmacokinetics. This course will include PowerPoint presentations and student presentations.

GRDM-G748 Principles of Toxicology I (1 cr) This course will present the fundamental concepts of toxicology necessary to understand the effects of chemicals on human health. Cellular and molecular mechanisms involved in toxic responses elicited by pharmaceutical and environmental agents, activation and detoxification of drugs and chemicals, and the principles of carcinogenesis and mutagenesis will be presented.

GRDM-G749 Introduction to Structural Biology (1 cr) An introduction to structural biology including the fundamentals of macromolecular structure and interactions, methods used to determine three-dimensional structures, the relationship between protein sequence and structure, and prediction and analysis of macromolecular structure.

GRDM-G751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr) Cellular signal transduction mechanisms comprise a complex communication network that governs cellular function and responses. These networks include communication between cells as well as that within cells. Signaling networks govern the ability of cells to perceive and correctly respond to their surroundings and are therefore critical in organ development, tissue repair, and homeostasis. Errors in signaling responses can result in diseases including cancer, neurodegeneration, pain, osteoporosis, autoimmunity, and diabetes. The potential modulation of cellular signaling networks is the basis of current research in disease in the 21st century. This course is designed to give graduate students in biological sciences a state-of-the-art education in cellular signaling mechanisms and the methodology used to study them. Landmark and breaking scientific journal articles in various signaling fields will be discussed and critically evaluated. Emphasis is given to both experimental design and results interpretation. Prior education in biochemistry and cell biology is required. By the end of this course, students will have a state-of-the-art current knowledge of the cytosolic and nuclear mechanisms of cellular signaling pathways. Students will have a working to design experiments to study signaling pathways, and how to interpret results. Students will have gained the skill of how to read, interpret, and critically evaluate published journal articles in the fields of cellular signaling mechanisms.

GRDM-G754 Principles of Toxicology 2 (1 cr) Xenobiotic-induced target organ toxicity will be discussed with respect to the biological and/or chemical factors that influence toxicity at a tissue site, the modes of action for producing damage, and the methodology used to measure injury. This course is designed to provide a foundation for understanding the complex interactions between toxicants and biological systems from a basic science approach.

GRDM-G755 Principles of Toxicology 3 (1 cr) The effects associated with specific classes of chemicals, including chemical agents that either demonstrate a great chance for injury and/or pose significant potential

for human exposure will be presented. The chemical classes covered will include selective metals, solvents and alcohols, pesticides, plastics and gases.

GRDM-G756 Radiation and Cancer Biology (3 cr) This is a graduate level course covering the effects of ionizing radiation at the cellular/molecular, tissue, and organismal level relevant to radiation oncology, radiology, and radiation protection. Topics include acute and late effects in normal tissue, and tumors, apoptosis, cell cycle checkpoints, DNA repair, tumor kinetics heritable effects, and carcinogenesis.

GRDM-G760 Epithelial Cell Biology (3 cr) An integrated approach to epithelial structure and function and the role of subcellular organization in organ physiology and pathophysiology.

GRDM-G761 Molecular & Cellular Physiology of Ion Channels (1 cr) Ion channels and transporters are crucial for life. Without these proteins, the heart will stop beating, and we will be unable to flex our muscles, see, smell, hear, taste, and think. The goal of this course is to introduce the fundamental concepts of molecular physiology of ion channels and transporters. The emphasis will be on the electrophysiological and optical methods used for investigating ion transport proteins. Specific topics will include ion channel biophysical characteristics and ion channel/transporter modulation and function. Two laboratory demonstrations will help students to master the learned concepts in a real experimental setting.

GRDM-G762 Physiology and Pathophysiology of Lipid Rafts. To acquire a core of essential principles about lipid raft structure and comprehensive insight into the functional process of these membrane domains by means of introductory lectures, review of current literature, and group discussions with an emphasis on experimental techniques used to examine membrane physiology.

GRDM-G 771 Analysis of Large Data Sets for Biologists (1 cr) This course will provide graduate students in biomedicine disciplines a foundation to apply the programming language R in a biological research analytics environment. After a primer on R programming, it then focuses on data processing and analysis specifically in the context of biomedical science research.

GRDM-G780 Foundations of Neuroscience (6 cr) This course will provide an introduction to the nervous system and its disorders. Specifically, the course will provide a broad-based introduction to the structure of the nervous system, its cellular composition and mechanisms through which neurons communicate and ultimately regulate behavior and cognition. The course incorporates an in-depth analysis of the current literature and methodology.

GRDM-G790 Special Topics in Biomedical Science (1-3 cr) This special topics course will focus on new, cutting-edge, and/or timely issues, ideas, and skills in the biomedical sciences. These courses will include a combination of lecture, independent reading and work, and interaction with course content, instructor, and/or peers.

GRDM-G791 Internship in Biomedical Science (1-3 cr) Prerequisites: Permission of Instructor. An internship course allowing incoming basic science doctoral graduate

students enrolled in programs (minors, etc.) that require internships.

GRDM-G792 Practicum in Biomedical Science (1-3 cr)Prerequisites: Permission of Instructor. A course allowing basic science doctoral graduate students enrolled in programs (minors, etc.) to complete practica experiences as required by a program. Required as part of the Policy Analysis for Biomedical Sciences doctoral minor. Permission of course director(s) is required.

GRDM-G793 Career Experiential Learning in Biomedical Science (1-2 cr) A field-based career experiential learning experience, this course allows PhD students who are in a PhD program (usually second year students, if entering through the IBMG Program for PhD study) to investigate career options in-depth. This experience can range from shadowing (observation only) to a short-term internship experience (not exceeding six weeks). Permission of instructor and the IU School of Medicine Graduate Division required.

GRDM-G801 Experimental Approaches to Cell Structure and FunctionThe overall objective of this graduate course in Cell Biology is to present in an experimental context, information integrating cell structure with cell function. The focus is on topics in which new information on cell structure has enhanced or re-formulated our understanding of cell function.

GRDM-G803 Research (1-4 cr) Mentored research for MD/PhD students.

GRDM-G807 Structural and Chemical Biology (2 cr)Fundamentals of structural and chemical biology focused on state-of-the-art approaches to inhibitor discovery, use of inhibitors in elucidating biological function, and computational and structural approaches to rational inhibitor design.

GRDM-G817 Molecular Basis of Cell Structure Function (2 cr)Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G819 Basic Bone Biology (3 cr) An introduction to basic bone biology, including bone morphology, composition and physiology; cell biology of bone cells; measurement techniques; adaptation to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development.

GRDM-G828 Concepts in Biotechnology (2 cr)Case studies exploring topics on the cutting edge of biotechnology and tutorials in biotechnology calculations.

GRDM-G830 Advanced Cardiovascular Physiology (3 cr) Advanced study of the cardiovascular system using contemporary methods is emphasized. Concepts of cardiovascular structure, function, hemodynamics, excitation-contraction coupling, signal transduction and electrophysiology are reinforced. The format of the course will include faculty lectures and facilitated interactive student discussion.

GRDM-G848 Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr)Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which is turn

have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr)Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G855 Experimental Design and Biostatistics (1 cr)This course will provide students with a functional understanding of experimental design and statistical testing in the biological sciences. Students will learn why a thoughtful approach to the design of their experiments and a rigorous, unbiased testing of their results are both important to their work and future careers. Students will receive an introduction to basic statistical theory with a practical focus on interpreting printouts from a variety of statistical programs (rather than a focus on students carrying out their own calculations). Practical examples of experimental design and statistical testing-both good examples and bad-will be worked through for a variety of real situations in biomedical research.

GRDM-G890 Applied Molecular Biology (3 cr)Basic principles and techniques in molecular biology and pathology. Particular emphasis will be on molecular techniques used to study pathogenesis of diseases.

GRDM-G910 Advanced Molecular Biology Methods (3 cr)Advanced theory and techniques in Molecular biology - the focus of the course will be on techniques related to manipulation of cloned DNA to study their expression, structure and function.

Biostatistics

Richard M. Fairbanks School of Public Health, Indianapolis and IU Indianapolis School of Science
Contact Information

Department of Biostatistics, HITS 3000, IU Indianapolis or IU Fairbanks School of Public Health, RG 6057, IU Indianapolis
or Department of Mathematical Sciences, LD 270, IU Indianapolis
School email: fsphinfo@iu.edu

Program URL: fairbanks.indianapolis.iu.edu/academics/doctoral/biostatistics

Curriculum

Degree Offered

Doctor of Philosophy (Ph.D.), Master of Science (M.S.), and doctoral minor in Biostatistics

MS in Biostatistics

The Fairbanks School of Public Health offers the first MS in Biostatistics in the state. Located on Indiana's premier health and life sciences campus, you will discover exceptional faculty, nationally-recognized research,

exciting study abroad options, an amazing network of alumni and mentors, and exposure to top visiting experts.

You will have hands-on learning opportunities right outside our doors through our connections with the IU School of Medicine, the Regenstrief Institute, the Indiana State Department of Health, the NCAA headquarters, Eli Lilly, the state's top health systems, and so many more. Together, these advantages will provide you with the foundation you need to be a highly competitive candidate for today's biostatistics jobs.

The Master of Science (MS) in Biostatistics provides a solid grounding in study design and data collection, management, analysis, and appropriate interpretation and communication of study findings. Graduates will have competencies in three areas: public health, biostatistics, and data management and computation.

Through this program, students receive highly focused training in statistical theory and biostatistical methods, with an emphasis on application in a broad array of health sciences. Students are trained to be professional biostatisticians who are well qualified for employment in government and private health agencies, industry, and research institutes. The MS program also serves as excellent preparation for doctoral programs in biostatistics.

Admission Requirements

All applicants to the Master of Science in Biostatistics must have a bachelor's degree from an accredited university or college, show evidence of satisfactory preparation in math and computer skills, and have an acceptable academic record.

Application, admission, and degree-granting requirements and regulations shall be applied equitably to all individuals, applicants and students regardless of age, gender, race, disability, sexual orientation, religion, or national origin.

Application Deadlines

Fall semester

U.S. applicants: July 1

International applicants: April 1

Admission Criteria

- Baccalaureate degree from an accredited university or college.
- Transcripts from all colleges and universities attended (except Indiana University)
- College Calculus I, II
- Competent written and oral communication skills.
- Other admission factors include strong references, work experience, and personal statement. Students meeting these requirements are not guaranteed admission.

Supporting Documentation

- **Graduate Record Examination (GRE):** GRE scores are not required for admission. To strengthen the application, GRE scores are strongly recommended if the cumulative GPA from all undergraduate institutions attended is below 3.0. Official GRE test scores taken within the past five years are acceptable. Applicants must submit GRE scores to

SOPHAS using the following designation DI Code 0167.

The admission committee does not list expected minimum scores.

- **Personal Statement:** The personal statement should be 750 words and can be uploaded to the Personal Statement section of SOPHAS. In your own words, describe experiences that have shaped your interest in public health and biostatistics. Discuss your past education, experience, and current professional objectives. You are encouraged to comment on your plans to use your education and training, the needs and /or challenges you perceive as important in the field, and any personal qualities, characteristics, and skills you believe will enable you to be successful in the field of biostatistics.

Your personal statement can be uploaded electronically to the SOPHAS application.

- **Résumé or Curriculum Vitae (C.V.):** For each position on the résumé or CV, provide the job title, employing agency, dates employed, and responsibilities held. Indicate any additional strengths or skills such as fluency in foreign languages, research experience, teaching experience, community service, and demonstration of leadership skills. Include professional certifications, honors, and awards.

Your résumé or CV can be uploaded electronically into SOPHAS and should not be mailed.

- **Letters of Recommendation:** Three letters of recommendation are required from professional sources that can provide an unbiased critical assessment of your abilities, skills, strengths, and weaknesses. Examples of professional and academic sources are academic advisors, professors, preceptors, or immediate supervisors. Examples of sources that are not acceptable include coworkers, colleagues, classmates, and relatives. Recommendation letters must be submitted electronically to **SOPHAS**.
- **Interview** The interviewees are invited at the discretion of the Admission Committee. The MS in Biostatistics admissions committee conducts interviews online for applicants who are unable to travel to Indianapolis for the interview. Note that applicants will need access to a webcam and microphone for the interview.
- **Proof of English Proficiency:** Applicants whose native language is not English or whose academic study was done exclusively at non-English speaking institutions, must prove English proficiency by providing either official Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores. Scores must be less than two years old.

Minimum score of 79. Submit scores to SOPHAS using the preferred minimum English language test scores for admission to the Fairbanks School of Public Health:

- Internet-based TOEFL: minimum score of 79
- Computer-based TOEFL: minimum score of 213
- Paper-based TOEFL: minimum score of 550

- IELTS (total band score): minimum score of 6.5

Applicants must submit:

- TOEFL scores to SOPHAS using the following designation DI Code: 5688
- IELTS scores can be uploaded electronically to SOPHAS. Upload IELTS scores in the standardized test section of the application and include your TRF Number.

Transcript

U.S. transcripts

Official post-secondary transcripts from all U.S. institutions attended (must be sent directly from the institutions to SOPHAS). This includes previous study at Indiana University campuses. U.S. applicants who studied at foreign institutions as part of a study abroad experience at their U.S. college or university do not need to provide a WES evaluation of their study abroad coursework.

Applicants are required to enter all U.S. coursework. Entering U.S. coursework allows SOPHAS to calculate GPAs that institutions use in reviewing applications, provides a way for institutions to review applications using electronic review forms and also allows for a mechanism to gather aggregate information about prior coursework. SOPHAS uses official transcripts to verify the self-reported coursework. This process significantly expedites the institution review process.

For regular mail, please send your transcript to:

SOPHAS
P.O. Box 9111
Watertown, MA 02471-9111

For overnight delivery only:

SOPHAS
c/o Liaison International
311 Arsenal Street
Watertown, MA 02472
Phone: 617-612-2090

Applicants who have not earned a degree at the time of application submission will be required to submit an official transcript upon acceptance to the IU Fairbanks School of Public Health. This official transcript should indicate your degree earned and date of conferral. If you did not earn your degree at the time you applied to SOPHAS, please send an updated official transcript with degree earned and date of conferral to:

IU Fairbanks School of Public Health
Office of Student Services and Admissions
Attn: Shawne Mathis
1050 Wishard Blvd., 5th Floor
Indianapolis, IN 46202

It is strongly recommended that all transcripts are submitted no later than April 1 to allow adequate time to verify transcripts by the July 1 deadline.

Foreign transcripts

All applicants with foreign academic credentials must provide a World Education Services (WES) ICAP course-by-course evaluation of those credentials. Because this process can take some time, applicants should submit

their transcripts to WES at least one month in advance of the application deadline (Spring - September 15 | Fall - March 1).

Through special arrangements with SOPHAS, WES will deliver its credential evaluation report directly to SOPHAS by secure electronic transmission. This expedites the delivery of the evaluation report as well as images of the applicant's verified transcripts to SOPHAS and allows SOPHAS to process the report most efficiently.

[Visit WES for more information.](#)

Transcripts must be sent from institution in the institutions sealed envelope directly to:

SOPHAS
P.O. Box 9111
Watertown, MA 02471-9111

For overnight delivery only:

SOPHAS
c/o Liaison International
311 Arsenal Street
Watertown, MA 02472
Phone: 617-612-2090

Apply now

You may apply to our MS in Biostatistics program [online via SOPHAS](#), the centralized Schools of Public Health Application Service.

Remember to designate the IU Richard M. Fairbanks School of Public Health as one of your school choices, along with your desired program.

We'll notify you by email once your application has been received. If you have questions about the application process, contact student services at (317) 274-2000.

Upon offer of admission, applicants will need to complete the required supplemental application, IU Graduate CAS, by using the invitation code and link provided with the admission offer. The IU Graduate CAS application resembles the SOPHAS application. To apply, unofficial transcripts earned at bachelor's, master's, or doctorate-granting institutions must be uploaded.

MS in Biostatistics Curriculum

All MS in Biostatistics candidates must satisfactorily complete a minimum of 36 credit hours. The curriculum includes required public health courses, biostatistics core courses, and biostatistics electives courses.

Required Coursework

Curriculum (30 credit hours)

Take both courses for a total of 6 credit hours

- PBHL-P 510 Introduction to Public Health (3 credits)
- PBHL-P 517 Fundamentals of Epidemiology (3 credits)

Take five courses for a total of 15 credits

- STAT-I 519 Introduction to Probability (3 credits) or STAT-51600 Basic Probability Applications (3 credits)

- PBHL-B 571 Linear Models and Categorical Data Analysis (3 credits)
- PBHL-B 581 Biostatistics Computing (3 credits) or PBHL-B 552 Fundamentals of Data Management (3 credits)
- PBHL-B 573 Applied Survival Data Analysis (3 credits)
- PBHL-B 626 Advanced Biostatistical Inference I (3 credits) or STAT-52800 Mathematical Statistics I (3 credits) or STAT-51700 Statistical Inference (3 credits)

Select two courses from the selection below for a total of 6 credits

- PBHL-B 582 Introduction to Clinical Trials (3 credits)
- PBHL-B 520 Introduction to Statistical Learning (3 credits)
- PBHL-B 670 Causal Inference (3 credits)
- INFO-B 519 Introduction to Bioinformatics
- INFO-B 528 Computational Analysis of High-Throughput Biomedical Data (3 credits) or INFO-B 574 Next Generation Sequencing Data Analysis (3 credits)
- PBHL-B 698 Research Course (3 credits)
- PBHL-B 574 Applied Longitudinal Data Analysis (3 credits)

Capstone for 3 credits

- PBHL-B 584 Biostatistics Practicum (3 credits)

MS Examination

The MS competence examination will be given twice a year. The first examination will be offered a week before the fall semester starts and the second exam may be offered a week before the spring semester if necessary. The examination consists of two parts: Theory and Application.

Theory examination covers the materials at the level of Stat 51600 and Stat 51700. Application examination covers the materials from PBHL-B571, PBHL-B572, and PBHL B573. Students are recommended to take the examination in the summer after year one in the program and will be given a second chance to pass the examination after three semesters in the program if they failed to pass in their first attempt.

Thesis Option (6 credit hours)

Register for B711 MS Thesis Research in Biostatistics. No elective courses are required when taking the Thesis Option.

Non-Thesis Option (6 credit hours)

Students taking the Non-Thesis Option are required to take the MS competency exam. After passing the exam, students must then take six credit hours of electives approved by the department.

Students who do not pass the MS competency exam will be required to enroll in B711 MS Thesis Research in Biostatistics.

Note on MS Examination

The MS competence examination will be given twice a year. The first examination will be offered a week before

the fall semester starts and the second exam may be offered a week before the spring semester if necessary. The examination consists of two parts: Theory and Application.

Theory examination covers the materials at the level of Stat 51600 and Stat 51700. Application examination covers the materials from PBHL-B571 and PBHL-B572 (fall) and PBHL B573 (winter). Students are recommended to take the examination in the summer after year one in the program and will be given a second chance to pass the examination after three semesters in the program if they failed to pass in their first attempt.

Doctor of Philosophy

The PhD in Biostatistics program at the IU Richard M. Fairbanks School of Public Health combines the statistical theory and modeling strengths of Indiana University Indianapolis's Department of Mathematical Sciences with the exceptional biostatistical methods research, health sciences applications, and public health experience of our own department of biostatistics. Students benefit from a low student/faculty ratio that promotes close interaction with faculty and targeted guidance of research.

Designed for individuals with strong quantitative and analytical skills and a strong interest in biological, medical, and/or health-related sciences, the 90-credit program can be completed on either a full-time or part-time basis.

Students will be well prepared to contribute to research, collaboration, and consulting across a broad spectrum of health and life science problems.

The program emphasizes the theory and concepts underlying statistical methods, the interpretation of results from experimental, as well as observational studies, and the practical realities of health-related studies and their analysis.

Application Deadlines

Matriculation: Students are admitted for matriculation in the fall only.

Deadline: December 15

All required application documents must be submitted by the PhD program deadline. It is strongly recommended that all transcripts are submitted no later than December 15 to allow adequate time to verify transcripts.

Any applicant to the PhD in Biostatistics who has a bachelor's or master's degree from an accredited institution and shows promise for successfully completing all the degree requirements will be considered for admission to this program.

Application, admission, and degree-granting requirements and regulations shall be applied equitably to all individuals, applicants, and students regardless of age, gender, race, disability, sexual orientation, religion, or national origin.

Admission Criteria and Requirements

In addition to completing the SOPHAS application, you are also required to submit the following supporting documentation directly to SOPHAS.

Admission Criteria

In addition to satisfying general Indiana University Graduate School requirements for admission, applicants must have at least a B (3.00 GPA) average in courses taken during the last two years of their earlier degree studies, and a grade of B+ (3.50 GPA) in courses required as prerequisites for the program.

Students entering this program should have a minimal mathematics background consisting of an undergraduate course sequence in univariate and multivariate calculus (equivalent to MATH 16500, 16600 and 26100 at IU Indianapolis) and a course in linear algebra (including matrix theory). In addition, applicants should have had a calculus-based undergraduate level course in probability or statistics. Prospective applicants who do not have this background must acquire it prior to admission to the program.

Graduate Record Examination (GRE): GRE scores are not required for admission, however, if you plan to attend the PhD program as a full-time funded student, you are strongly encouraged to submit them with your application, since some funding sources require current GRE scores (less than five years old) in order for students to be eligible. Applicants must submit GRE scores to SOPHAS using the following designation DI Code: 0167.

The admission committee does not list expected minimum scores.

Statement of Purpose and Objectives: Provide an essay of approximately 750 words describing your past education, experience, and current professional career objectives. You are encouraged to comment on any or all of the following: plans you have to use your education and training; the needs and/or challenges you perceive as important in your field of study; and, any personal qualities, characteristics, and skills you believe will enable you to be successful in your chosen field of study.

Resume or CV: For each position on the résumé or CV, provide the job title, employing agency, dates employed, and responsibilities held. Indicate any additional strengths or skills such as fluency in foreign languages, research experience, teaching experience, community service, and demonstration of leadership skills. Include professional certifications, honors, and awards.

Official Post-Secondary Transcripts: Transcripts from all U.S. institutions attended are required (must be sent directly from the institutions to SOPHAS). This includes previous study at Indiana University. It is strongly recommended that all transcripts be submitted no later than December 15 to allow SOPHAS adequate time to verify transcripts. Please note that it can take up to four weeks for transcripts to be verified.

World Education Services (WES) ICAP evaluation of foreign academic credentials

The Indiana University Richard M. Fairbanks School of Public Health requires all applicants with foreign academic credentials to provide a World Education Services (WES) ICAP course-by-course evaluation of those credentials. Applicants should submit their transcripts to WES at least one month in advance of the application deadline to ensure that the evaluation is completed in time.

Through special arrangements with SOPHAS, WES will deliver its credential evaluation report directly to SOPHAS

by secure electronic transmission. This expedites the delivery of the evaluation report—as well as images of the applicant's verified transcripts—to SOPHAS and allows SOPHAS to process the report most efficiently.

[Visit WES for more information](#)

U.S. applicants who have attended post-secondary institutions outside of the U.S. as part of a study-abroad program at a U.S. college or university, do not need to provide a WES evaluation of their foreign coursework as long as it is noted on their U.S. transcript.

Please note: Upon admission to IU Indianapolis, international students will be required to provide the Indiana University Office of International Affairs with original transcripts from all universities attended in the U.S. and abroad.

Letters of Recommendation: Three letters of recommendation are required from persons qualified to assess your academic work; clinical, public health, or professional experiences; or leadership potential in public health. These letters should be from professional sources that can provide an unbiased, current and critical assessment of your abilities, skills, strengths, and weaknesses related to successfully completing a doctoral program.

Interview: The applicants are invited to interview at the discretion of the admission committee.

The PhD in Biostatistics admissions committee conducts interviews online for applicants who are unable to travel to Indianapolis for the interview. Note that applicants will need access to a webcam and microphone for the interview.

Proof of English Proficiency: Applicants whose native language is not English or whose academic study was done exclusively at non-English speaking institutions must:

1. Prove English proficiency by providing either official Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores
2. Minimum requirements for admission for IU Programs: TOEFL (79) and 6.5 IELTS. Students who are admitted with TOEFL of 79-99 or IELTS of 6.5-7.0 will take the English for Academic Purposes (EAP) placement test. Depending on your EAP test results, you may need to take EAP courses at the same time as your academic major courses for one or two semesters.
3. The preferred minimum English language test scores for admission to the Fairbanks School of Public Health are:
 - Internet-based TOEFL: minimum score of 100
 - Computer-based TOEFL: minimum score of 250
 - Paper-based TOEFL: minimum score of 600
 - IELTS (total band score): minimum score of 7
4. Scores must be less than two years old.
5. [TOEFL](#) scores to SOPHAS using the following designation DI Code: **5688**. [IELTS](#) scores can be uploaded electronically to SOPHAS. Upload

IELTS scores in the standardized test section of the application and include your TRF Number.

English language test waiver

The English language test requirement may be waived if an applicant has earned a bachelor's degree or higher from the U.S. or other English-speaking country.

Review of Application

Completed applications will be carefully reviewed by the Biostatistics PhD Admissions Committee after the program deadline. Applicants are notified of their admission status in March. The Admissions Committee will determine each applicant's acceptance or non-acceptance to the Biostatistics PhD program by using the following selection criteria:

- *Scientific leadership potential:* Assessed by the applicant's resume / curriculum vita, personal statement, and personal interview.
- *Ability to engage in advanced graduate work:* Assessed by the applicant's personal interview, evaluation of letters of recommendation, overall grade point average in prior graduate work, and scores from the GRE or other graduate entrance exams.
- *Learning goals and objectives:* Assessed by the applicant's personal statement and personal interview.

Apply Now

You may apply to our Biostatistics PhD program [online via SOPHAS](#), the centralized Schools of Public Health Application Service.

Remember to designate the IU Richard M. Fairbanks School of Public Health as one of your school choices, along with your desired program.

We'll notify you by email once your application has been received. If you have questions about the application process or about the PhD in Biostatistics program, contact [Shawne Mathis](#).

Note: All applications must be verified by SOPHAS prior to the deadline to be guaranteed review by the PhD Biostatistics admissions committee. Applications that are not verified by the deadline are not guaranteed review. Applications take four to five weeks to be verified by SOPHAS. We recommend submitting your application to SOPHAS no later than one month prior to the deadline.

Upon offer of admission, applicants will need to complete the IU Graduate CAS, a required secondary application, by using the invitation code and link provided with the admission offer. The IU Graduate CAS application resembles the SOPHAS application. To apply, unofficial transcripts earned at bachelor's, master's, or doctorate-granting institutions must be uploaded.

PhD in Biostatistics Curriculum

All PhD candidates must satisfactorily complete a minimum of 90 credit hours that includes required biostatistics core courses, statistics elective courses, a doctoral minor, elective courses, independent studies and directed dissertation research. To complete this degree, you will take a combination of required

biostatistics courses, public health courses, biostatistics elective courses, a doctoral minor, further elective courses, independent studies, and directed dissertation research that together total 90 credit hours. The specific distribution of courses is as follows:

Program Requirements

Public Health Courses (6 credits)

- PBHL-P 510 Introduction to Public Health
- PBHL-B 517 Fundamentals of Epidemiology

Core Courses (18 credits)

- PBHL-B 571 Linear Models and Categorical Data Analysis (3 credits)
- PBHL-B 573 Applied Survival Data Analysis (3 credits) or STAT-I 536 Introduction to Survival Analysis
- PBHL-B 574 Applied Longitudinal Data Analysis (3 credits)
- PBHL-B 626 Advanced Biostatistical Inference (3 credits) or STAT-I 528 Mathematical Statistics I (3 credits)
- STAT-I 519 Introduction to Probability (3 credits)
- STAT-I 526 Multivariate Analysis and Generalized Linear Models (3 credits)

Required Coursework

- PBHL-B 582 Introduction to Clinical Trials (3 credits)
- PBHL-B 584 Biostatistics Practicum (3 credits)
- PBHL-B 629 Statistical Learning and High Dimensional Data Analysis (3 credits)
- STAT-I 628 Advanced Statistical Inference (3 credits)

Elective Coursework

Select 4 for a total of 12 credits; at least 6 credits at the 600 level.

- PBHL-B 520 Introduction to Statistical Learning (3 credits)
- PBHL-B 581 Biostatistics Computing (3 credits) or PBHL-B 552 Fundamentals of Data Management (3 credits)
- PBHL-B 616 Advanced Statistical Computing (3 credits)
- PBHL-B 636 Advanced Survival Analysis (3 credits)
- PBHL-B 646 Advanced Bayesian Statistical Models (3 credits)
- PBHL-B 656 Advanced Longitudinal Data Analysis (3 credits)
- PBHL-B 630 Causal Inference (3 credits)
- PBHL-B 631 Adaptive Clinical Trial Design (3 credits)
- PBHL-B 670 Topics in Public Health (3 credits)
- PBHL-B 698 Research Course (3 credits)
- **Any math or statistics course at the 500 or 600 level with advisor approval*

The remaining 42 credit hours will be taken as additional coursework in a minor area (12 credit hours), further elective courses, independent studies, and directed dissertation research (at minimum 24 credit hours). This totals to 90 credit hours for the Biostatistics program. The minor may be completed in any area related to the health

and life sciences disciplines, such as pharmacology and toxicology, epidemiology, genetics, biology, physiology, bioinformatics, health policy, translational science and health economics, among many others.

Transfer Coursework: Candidates for the PhD degree may petition for up to 30 credit hours of graduate credit from other institutions. Students should submit the Petition for Approval of Transfer Course form to initiate the process and receive approval to apply a course completed at a different institution toward their degree. Students must provide, at minimum, the syllabus for the course under evaluation. Other documentation may be requested.

Expired Coursework: Normally, a course may not apply toward degree requirements if it was completed more than seven years prior to the passing of the preliminary examination. Students must submit the Petition For Course Revalidation form to initiate an appeal process and receive approval to apply an expired course toward their degree. Students must provide, at minimum, the syllabus for the course under evaluation. Other documentation may be requested.

Elective Coursework: Students must submit the Petition for Approval of Elective Course form to initiate an appeal process and receive approval to apply a course completed in a different department toward their degree. Students must provide, at minimum, the syllabus for the course under evaluation. Other documentation may be requested.

Minor Area (12 credit hours): In addition to the 48 credit hours of formal statistics/biostatistics and public health coursework, all students must complete a minor in an area related to any of the health and life sciences disciplines. The minor may be obtained in areas such as pharmacology and toxicology, epidemiology, genetics, biology, physiology bioinformatics, public health and health economics, among many others and must be approved by the student's advisor or graduate committee. The minor must contain a minimum of four graduate level courses (12 cr.) in the chosen area and it must comply with the minor requirements of the respective department/unit.

Dissertation: B800 Biostatistics Doctoral Dissertation Research (minimum 30 credits)

Program Requirements

Qualifying Examinations - written part (required):

Students must pass an initial qualifying examination in the areas of Probability, Mathematical Statistics, Generalized Linear Models, Longitudinal Data Analysis and Survival Analysis. The qualifying examination is a written examination offered once a year during a two-day

Qualifier Exam Session the week before classes start in August and is administered in two sections – Theoretical Biostatistics and Applied Biostatistics. The preparation and the administration of the qualifying examination are overseen by the Graduate Examination Committee. Students are expected to have completed and passed both sections of the qualifying examination on or before their qualifier deadline.

Deadline for full-time students:

The deadline for passing the written part of the qualifying examination for full-time students who enter the program

with a master's degree in statistics/biostatistics is August at the end of their second year. The deadline for full-time students who enter the program without a master's degree in statistics/biostatistics is August at the end of their third year.

Deadline for part-time students:

The deadline for passing the qualifying examinations for part-time students who enter the program with a master's degree in statistics/biostatistics is August at the end of their third year; the deadline for part-time students who enter the program without a master's degree in statistics/biostatistics is August at the end of their fourth year.

If students do not pass both sections of the examination by their qualifier deadline, they will have their privilege to continue in the program terminated.

A student will have at most two attempts to pass the examination. The first attempt must include the entire examination, i.e. both the Theoretical and Applied sections. If one or both sections are not passed on the first attempt, then a second attempt on or before the deadline is allowed. During the final attempt, the student may only sit for the section(s) not passed in the first attempt.

A student's first attempt at the qualifying examination will result in one of the following three outcomes:

Pass Both Sections: The student has demonstrated fundamental understanding of the core material and the examination committee believes he/she will be successful in completing the Ph.D. program.

Pass One Section: The student has demonstrated fundamental understanding of one section, but lacks adequate understanding of the other section. The student must sit for the section not passed at a future examination session.

Fail: The student has failed to demonstrate an adequate understanding of the material from the core courses and thus fails the examination. The student must sit for both sections at a future examination session. A student's second and final attempt at the written qualifying examination will result in one of the following two outcomes:

Pass: The student has demonstrated fundamental understanding of the core material and the examination committee believes he/she will be successful in continuing the Ph.D. program.

Fail: The student has failed to demonstrate an adequate understanding of the material from the core courses and thus fails the examination, with privilege to continue in the program terminated. Students who failed any part of the written qualifying examinations will be availed within one month of the announced results, the opportunity to review their graded examinations and appeal their grades if they choose to do so. The program Directors will not accept for consideration any appeal beyond this one month period.

Qualifying examinations - oral part (required): A student becomes eligible to take the oral part of the qualifying examinations after successfully passing the written qualifying examination. This examination consists of a presentation on an advanced research topic suggested by the student to the student's advisory committee, which administers this examination. In

preparation to this examination, the student must provide the committee with a paper (10 – 15 pages) outlining the advanced topic to be covered, clearly indicating the scope and depth of the planned research along with relevant references. In the examination, the student is expected to display an in-depth understanding of the chosen subject matter. The committee may ask the student questions which normally will be directed to the subject matter of the research but may, by natural extension, also cover any other relevant topic including the minor subject. The oral qualifying examinations will normally be completed at the end of all required course work, including the minor area, before the student embarks on the dissertation. The student must pass this examination before passing on to candidacy.

Admission to Candidacy: Following the passing of the qualifying examinations and the completion of all required coursework, the student's advisory committee will nominate the student to candidacy. Upon approval of the Dean of the University Graduate School, the student will be admitted to candidacy.

Final Examination: Oral Examination, primarily a defense of the dissertation in a public forum.

Normal Progress and Termination: Students must maintain satisfactory progress towards their degree objective to ensure their continued good standing in the program and financial support. The minimum criteria for satisfactory progress are a GPA of 3.00 or above, satisfactory research progress, and completion of other degree requirements (written and oral qualifying examinations, minor area requirements, candidacy requirements). If at any time the GPA drops below 3.0, the student will be placed on academic probation. Financial support may be rescinded if the GPA is not increased to

3.0 in a reasonable time period. Further, if the student's GPA in two consecutive semesters is below 3.0 the student's standing in the Biostatistics PhD program will be terminated.

In addition, credit towards the doctoral degree will not be given for any course in which the student obtains a grade of "B-" or below. This includes students' work on their research. If, in the opinion of the research committee, satisfactory research progress is not being made, a meeting of the student's research committee may be convened. This meeting will include a brief presentation by the student on the work accomplished up to that point, and/or a discussion concerning the problems which have hampered progress. If the consensus of the committee is that the student needs to show improvement, he/she will have 60 days to demonstrate a change in research performance. At the end of this time, financial support may be discontinued, if applicable.

Biostatistics Doctoral Program Director: William Fadel, Ph.D.

Doctoral Minor in Biostatistics

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctoral/minors/

Departmental Email: fsphinfo@iu.edu

(Please note that when conferring University Graduate School degrees, minors, certificates, and sub-plans, The

University Graduate School's staff use those requirements contained only in *The University Graduate School Bulletin*.)

The IU Richard M. Fairbanks School of Public Health offers a PhD Minor in Biostatistics that teaches advanced statistical analysis that goes beyond the competencies required by most PhD programs. People who possess these special health-focused analytical and database management skills are in high demand due to the value they add to research projects.

The doctoral minor in biostatistics is comprised of a minimum of 12 credit hours and serves as a useful complement to many major areas of study. You will learn both the theoretical concepts that underlie the scientific method and how to apply these concepts to perform effective data collection, analysis, interpretation, and reporting of results.

This minor emphasizes the design and analysis of experimental and observational studies, the theory of probability and statistics, and statistical computing, making it particularly valuable to students in health-related doctoral programs. The minor is ideal for students from many schools, including the IU schools of Nursing, Dentistry, Medicine, Health and Rehabilitative Sciences, and Public and Environmental Affairs.

Students who wish to obtain a doctoral minor from the IU Richard M. Fairbanks School of Public Health must earn a grade of "B" or better in the coursework for the minor. Courses in which a grade of "B-" or lower is earned will not apply toward completion of the minor. Faculty in the department of biostatistics will serve as advisors for students choosing this minor.

Curriculum

The discipline of biostatistics is growing in national and international importance, is integral to many areas of pursuit, enhances analytic and databased management skills that are desirable for many doctoral level research projects, offers population-based research perspectives, offers skills that are of interest to the private and public sectors, and formally acknowledges the quantitative course work that doctoral students often take as electives through the Department of Biostatistics.

Students who pursue a minor in biostatistics will complement their major area of study with concepts underlying the scientific method and applications of data collection, analysis, interpretation, and reporting of results. The minor in biostatistics emphasizes the design and analysis of experimental and observational studies, theory of probability and statistics, and statistical computing.

The curriculum for the PhD Minor in Biostatistics provides students with a rigorous grounding in the application of biostatistics in health-related research. This minor requires a strong quantitative aptitude and an interest in biomedical and public health applications.

Prerequisites for the Minor in Biostatistics

The following courses or course equivalents are required prerequisites:

- PBHL-P 551 Biostatistics I for Public Health or PBHL –B 561 – Biostatistics I or equivalent

- PBHL-B 562 –Biostatistics II for Public Health

Required Courses

Three (3) required courses:

- PBHL-B 571 Biostatistics Method I: Linear Regression Model (3 credit hours)
- PBHL-B 572 Biostatistics Method II: Categorical Data Analysis (3 credit hours)
- PBHL-B 573 Biostatistics Methods III: Applied Survival Analysis (3 credit hours)

Choose one of the following electives:

- PBHL-B 574 – Biostatistics Methods IV: Applied Longitudinal Data Analysis (3 credit hours)
- PBHL-B 582 – Introduction to Clinical Trials (3 credit hours)

Other courses may be taken if approved by the student's minor advisor. In this case, students should work with their program director to identify and approve any course substitutions for this minor.

The student's minor advisor will monitor satisfactory completion of the requirements for the minor in biostatistics. Doctoral students must notify the Fairbanks School of Public Health before beginning their course of study for the minor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

500 Level

PBHL-P 510 Introduction to Public Health (3 cr.)

Students will learn the basic foundations and disciplines of public health. Explore the public health impact where populations live, work and play will be covered. Students will develop tools to examine issues and create solutions through a public health lens.

PBHL-P 517 Fundamentals of Epidemiology (3 cr.)

This course will introduce students to basic epidemiologic concepts including determinants of health and patterns of disease in populations, population health descriptive techniques, use of health indicators and secondary data sources. Students will gain an understanding of the role of Epidemiology in developing prevention strategies and policy. Among the topics to be covered are measures of mortality and morbidity, design and analysis of observational studies, community health assessment, and program evaluation.

PBHL-P 551: Biostatistics for Public Health (3 cr.)

This course introduces the basic principles and methods of data analysis in public health biostatistics. Emphasis is placed on public health examples as they relate to concepts such as sampling, study design, descriptive statistics, probability statistical distributions, estimation, hypothesis testing, chi-square tests, analysis of variance, linear regression, and correlation.

PBHL-B 552: Fundamentals of Data Management (3 cr.) This course teaches concepts related to research data planning, collection, storage, processing, and

dissemination. The curriculum includes theoretical guidelines and practical tools for conducting public health research. Hands-on training with real-world examples and problem-solving exercises in SAS will be used to ensure that students are comfortable with all concepts.

PBHL–B 561: Introduction to Biostatistics I (3 cr.)

P: One year undergraduate mathematics is required. Working knowledge on linear algebra and elementary calculus is expected. Students with insufficient mathematics preparation are expected to remedy the deficiency on their own. This course introduces the basic principles and methods of data analysis in public health biostatistics. Emphasis is placed on public health concepts such as sampling, study design, descriptive statistics, probability, statistical distributions, estimation, hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation. SAS software is required.

PBHL–B 562: Biostatistics for Public Health II (3cr.)

P: PBHL-B 551 or PBHL-B 561 or one semester of graduate level biostatistics. This course introduces the advanced principles and methods of data analysis in public health biostatistics. Emphasis is placed on public health examples as they relate to concepts such as: Multiple regression, analysis of variance and covariance, logistic regression, nonparametric statistics, survival analysis, epidemiology statistics, and repeated measures analysis.

PBHL–B 571 Bio Methods I: Linear Models in Public Health (3 cr.)

P: PBHL–B 561 or equivalent. This course introduces some basic designs of experiment and analysis tools for outcome data of continuous variable, such as Analysis of Variance (ANOVA), Analysis of Covariance and Linear Regression Analysis. SAS programming language will be the primary statistical analytical tool for the course.

PBHL–B 572: Biostatistics Method II: Categorical Data Analysis (3 cr.)

P: PBHL–B 571 or equivalent. This course covers applied statistical methods for the analysis of categorical data with special emphasis on data collected from epidemiologic studies and general biomedical studies. The topics delivered in this course will focus on methods of categorical analysis commonly used in practice of the health sciences.

PBHL–B 573: Biostatistics Method III: Applied Survival Data Analysis 3 cr.)

P: Students must have taken one course in basic statistics and another course in linear regression models. Students must have prior knowledge of SAS for completion of homework. This course covers the basic concepts of survival analysis, Kaplan-Meier curves, logrank test, Cox proportional hazard model, parametric survival models, and certain extensions. Expectations upon completion: for survival data, you should know which method to use, how to implement in software and how to interpret the results.

PBHL–B 574 Biostatistics Method IV: Applied Longitudinal Data Analysis (3 cr.)

This course covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data, including the unbalanced and incomplete data frequently encountered in biomedical research. Class presentations and homework assignments will focus on data analysis in

SAS using PROC GLM, PROC MIXED, PROC GENMOD, and PROC NL MIXED.

PBHL-B 581 Biostatistics Computing (3 cr.) This is a course teaching fundamental concepts of biostatistical computing, a broad set of skills required for data acquisition, processing and visualization. At the end of the course the student will be able to manage statistical data, use reproducible reporting functionality, write their own functions, apply string and document processing techniques, have an understanding of object-oriented programming in R, use non-standard evaluation (NSE) techniques within the R language, and create reproducible software in package form for the R language.

PBHL-B 582 Introduction to Clinical Trials (3 cr.) Analysis of variance and regression (G652 or equivalent). A working knowledge of biostatistics is assumed and general familiarity with clinical trials will be helpful. This is a standard course that prepares biostatisticians for support of clinical trial projects. The course will cover fundamental aspects of the appropriate design and conduct of medical experiments involving human subjects (clinical research/trials) including ethics, design, sample size calculation, randomization, monitoring, data collection, analysis and reporting of the results.

PBHL-B 583 Applied Multivariate Analysis (3 cr.) The course will focus on applications to real data, which will be analyzed by the professor and the students using the SAS software. One priority of the course will be to have students perform many analyses on real data sets, via SAS take-home labs, to prepare students for real life applications in analyzing data and interpreting results. Students will gain experience in preparing data for analyses by merging data sets and recoding variables.

PBHL-B 584 Biostatistical Practicum (1-3 cr.) Statistical data analysis and study design is an art in practice. When and how to apply different statistical models and the interpretation of data analysis results is heavily driven by experience. This course is designed to develop students' skills in study design, data analyses, and oral and written communication through multiple real-life projects.

STAT-I 512 Applied Regression (3 cr.) P: STAT 51100 or equivalent. Inference in simple and multiple linear regression, residual analysis, transformations, polynomial regression, model building with real data, nonlinear regression. One-way and two-way analysis of variance. Use of existing statistical computing package.

STAT-I 516: Basic Probability Applications (3 cr.) P: MATH-I261. A first course probability, intended to serve as a background for statistics and other applications. Sample space and axioms of probability, discrete and continuous random variables, conditional probability and Bayes' theorem, joint and conditional probability distributions, expectations, moments and moment generating functions, law of large numbers and central limit theorem.

STAT-I 519 Introduction to Probability (3 cr.) P: MATH26100 or equivalent. Algebra of sets, sample spaces, combinatorial problems, conditional probability, independence, random variables, distribution functions, characteristic functions, special discrete and continuous

distributions, distributions of function of random variables, limit theorems.

STAT-I 517: Statistical Inference (3 cr.) A basic course in statistical theory covering standard statistical methods and their application. Estimation including unbiased, maximum likelihood, and moment estimation; testing hypothesis for standard distributions and contingency tables; confidence intervals and regions; introduction to nonparametric tests and linear regression.

STAT-I 525 Generalized Linear Model (3 cr.) P: STAT52800 or equivalent or consent of instructor. Generalized linear models, likelihood methods for data analysis, diagnostic methods for assessing model assumptions. Methods covered include multiple regression, analysis of variance for completely randomized designs, binary and categorical response models, and hierarchical log-linear models for contingency tables.

STAT-I 528 Mathematical Statistics I (3 cr.) P: STAT51900 or equivalent. Sufficiency and completeness, the exponential family of distributions, theory of point estimation, Cramer-Rao inequality, Rao-Blackwell Theorem with applications, maximum likelihood estimation, asymptotic distributions of MLEs, hypothesis testing, Neyman-Pearson Lemma, UMP tests, generalized likelihood ratio test, asymptotic distribution of the GLR test, sequential probability ratio test.

STAT-I 536 Introduction to Survival Analysis (3 cr.) P: STAT 51700 or equivalent. Deals with the modern statistical methods for analyzing time-to-event data. Background theory is provided, but the emphasis is on the applications and the interpretations of results. Provides coverage of survivorship functions and censoring patterns; parametric models and likelihood methods, special lifetime distributions; nonparametric inference, life-tables, estimation of cumulative hazard functions, the Kaplan-Meier estimator; one and two-sample nonparametric tests for censored data; semiparametric proportional hazards regression (Cox Regression), parameters' estimation, stratification, model fitting strategies and model interpretations. Heavy use of statistical software such as Splus and SAS.

600 Level

PBHL-B 616 Advanced Statistical Computing (3 cr.) This course will cover selected computational techniques useful in advanced statistical applications and statistical research. Topics to be covered include methods for solving linear equations, numerical optimization, numerical integration, Expectation-Maximization (EM) algorithm, Monte Carlo method, Bayesian methods, bootstrap methods and stochastic search algorithms.

PBHL-B 626 Advanced Likelihood Theory (3 cr.) This course covers theoretical foundation of statistical inference with focus on likelihood theory and its application on biomedical studies. It provides a good preparation for advanced biostatistics courses such as Advanced GLM, Advanced Longitudinal Data Analysis, and Advanced Survival Analysis.

PBHL-B 636 Advanced Survival Analysis (3 cr.) P: Stat 528 and Stat 536. Addresses the counting process approach to the analysis of censored failure time data.

The course also introduces the modern empirical process theory. Standard statistical methods in survival analysis will be examined in detail. Also, more advanced survival analysis methods will be presented.

PBHL-B 646 Advanced Generalized Linear Model (3 cr.) This course provides a comprehensive coverage of Bayesian modeling approaches, aimed at equipping students with the conceptual understanding, theoretical foundations, and computational skills necessary for Bayesian analysis in biostatistical research. All methods will be presented in the context of modern statistical models.

PBHL-B 656 Advanced Longitudinal Data Analysis (3 cr.) P: PBHL-B 574 and familiarity with concepts and theory of statistical inference. Students who are uncertain about their level of preparation are encouraged to contact the instructor. This course covers the theory of classical and modern approaches to the analysis of clustered data, repeated measures, and longitudinal data. Topics include random effects, generalized estimating equations, statistical analysis of repeated categorical outcomes, nonparametric and semiparametric regression, joint modeling, and estimation with missing data.

PBHL-B 698 Advanced Biostatistical Topics (1-3 cr.) This course has a variable title and can be offered for variable credits. Similar to topics courses offered in other IU programs, this course offers an introduction to a variety of public health topics and current issues will be covered in this course.

PBHL-B 800 Biostatistics Doctoral Dissertation Research (1-8 cr.) The dissertation will be written on an original topic of biostatistics research and presented as one of the final requirements for the PhD degree. The dissertation must be an original contribution to knowledge and of high scholarly merit.

STAT-I 619 Probability Theory (3 cr.) P: STAT 51900, 52800 or equivalent. Theory Measure theory based course in probability. Topics include Lebesgue measure, measurable functions and integration. Radon-Nikodym Theorem, product measures and Fubini's Theorem, measures on infinite product spaces, basic concepts of probability theory, conditional probability and expectation, regular conditional probability, strong law of large numbers, martingale theory, martingale convergence theorems, uniform integrability, optional sampling theorems, Kolmogorov's Three series Theorem, weak convergence of distribution functions, method of characteristic functions, the fundamental weak compactness theorems, convergence to a normal distribution, Lindeberg's Theorem, infinitely divisible distributions and their subclasses.

STAT-I 628 Advanced Statistical Inference (3 cr.) P: STAT 51900, 52800, C: STAT 61900 or equivalent.. Real analysis for inference, statistics and subfields, conditional expectations and probability distributions, UMP tests with applications to normal distributions and confidence sets, invariance, asymptotic theory of estimation and likelihood based inference, U-statistics, Edgeworth expansions, saddle point method.

Chemistry

Department of Chemistry and Chemical Biology

Science Building, LD 326, 402 N. Blackford Street, Indianapolis, IN 46202-3274

Phone: (317) 274-6872; fax: (317) 274-4701

Department URL: science.indianapolis.iu.edu/chemistry

Department Chair: Partha Basu, Ph.D.

Graduate Program Advisor: Jingzhi Pu, Ph.D.

Graduate Program Coordinator: Hannah Kraus

Curriculum

Courses

Degrees offered

Master of Science (M.S.), Doctor of Philosophy (Ph.D.)

Admission Requirements

The prospective student should have a bachelor's degree from an accredited institution, show promise of ability to engage in advanced work, and have adequate preparation in the field of chemistry (at least 35 credit hours of chemistry coursework, broadly representative of the major fields of the discipline). Applicants with an undergraduate grade point average of 3.00 or higher (on a 4.00 scale) will be considered for admission as regular graduate students. Applicants with a GPA below 3.00 may also be considered for admission on a probationary basis. Other application materials include three Letters of Recommendation, a Personal Statement, Graduate Record Examination (GRE) General Test scores (required for PhD applicants and optional for MS applicants), and a resume/CV (optional).

Additional Requirements: Applicants whose first language is not English must take the TOEFL, IELTS, or other exam approved by IU Indianapolis for graduate admission. The minimum scores required for admission are 79 for the TOEFL internet-based test or 6.5 overall for the IELTS. Other accepted exams and their minimum required scores can be found on the IU Indianapolis website. For a list of countries that may be exempt from providing English proficiency exam results, please visit the Office of International Affairs website.

One original copy of the official transcript(s) of each previously attended college and/or university is required. Transcripts cannot be considered official unless they are sent directly from the college or university attended to IU Indianapolis. Transcripts can also be sent by the college or university attended via online credential management services such as Parchment. International students must also provide the official or provisional degree certificate if the degree award is not shown on the transcript. Both should be sealed and signed by the college or university.

Please arrange for official copies to be sent to the Department Graduate Program Coordinator. All degrees awarded should be documented. Your transcripts, as well as a list of any university courses and their titles which do not appear on the transcript(s), should be sent to the Department via email at inchem@iu.edu or to the mailing address:

Graduate Program Coordinator
Department of Chemistry and Chemical Biology
Indiana University Indianapolis
402 North Blackford Street, LD 326
Indianapolis, IN 46202-3274

Application for Admission – Inquiries about the application process can be directed to Graduate Admissions, Department of Chemistry and Chemical Biology, IU Indianapolis, 402 N. Blackford Street, LD 326, Indianapolis, IN 46202-3272; phone (317) 274-6872; or via the department website. For full-time study, applications should be completed by January 15 for the following Fall semester to ensure full consideration for fellowships and other financial support. Late applications will be considered only if full-time positions are available. Applications for part-time graduate admission may be submitted up to two months prior to the intended starting date. Non-degree seeking graduate students (not in a degree program) may enroll in courses by contacting the IU Graduate Office; note that no more than 12 credit hours completed in non-degree status may be counted toward a degree.

Transfer Credit – The Department will accept by transfer a maximum of 6 credit hours of graduate coursework (beyond the undergraduate degree requirements) from an approved institution, subject to approval by the graduate director.

Academic Status and Satisfactory Progression A minimum cumulative GPA of 3.0/4.0 is required of all chemistry graduate students. A student is automatically considered as probationary if at any time the cumulative index falls below 3.0. Two semesters of coursework leading to a GPA < 3.0 generally results in the loss of financial aid (Teaching and Research Assistantships and fee remission). Moreover, after two semesters of work under a 3.0 index, students will not be permitted to register for classes without permission from the Chair in consultation with the Graduate Director and Thesis Advisor. Additionally, any student who receives a grade of C or below is subject to dismissal from the graduate program.

Leave of Absence policy

Students with a Graduate Student Academic Appointment (SAA) should contact the department if a leave longer than two to three weeks, including a complete break from all work activities and academic responsibilities, is needed. The leave should not extend beyond the length of the student's contract. A maximum of one leave per academic year is allowed. Students with financial aid/loan repayments should consult with their campus financial aid office as well. Students with an SAA should sign a Leave of Absence form prior to the leave and a Return from Leave of Absence form upon return.

Internship

For students who are selected for an internship opportunity with an organization outside of Indiana University Indianapolis, you need to register for 0 credits of CHEM-I 599 Special Assignments under Dr. Partha Basu. If you will not be on campus working with your research group during that time, you also need to fill out a Leave of Absence form. See Beverly Foley and Hannah Kraus.

M.S. in Chemistry

Program Description: The M.S. program in Chemistry requires 30 credit hours of study beyond the baccalaureate level and is designed for students seeking careers as professional chemists. Graduates of the

program often pursue industrial positions, while others continue to Ph.D. programs in chemistry or related fields. The general degree requirements include completing core courses from three of the five major areas of chemistry (analytical, biological, inorganic, organic, physical). Typically, students take three courses in their primary area and two outside it to meet these requirements. The M.S. degree can be earned through two options: the thesis option or the non-thesis option.

Thesis Option (M.S.) – This traditional full-time program requires 18 credit hours of coursework (including 2 cr. of seminar and 1 cr. of special assignments) and 12 credit hours of thesis research. The research culminates in the completion and defense of a thesis.

Non-thesis Option (M.S.) – The non-thesis option requires 30 credit hours of graduate coursework. Because *actual research experience is essential* in an advanced chemistry program, this option is recommended only for part-time students who are already engaged in research as part of their employment. Non-thesis students may enroll in a limited amount of research study (e.g., CHEM-I 599) to count toward degree requirements.

Program Requirements

- Minimum GPA requirement for graduation: 3.0
- Minimum grade of B- for all listed coursework
- When considering 15 credits within the Major Area and Core Electives at least 12 of the 15 CHEM credits must be 600 level or above.

MS-THESIS

Core Required Seminar (3 credits)

- CHEM-I 695 Seminar (2 credits)
- CHEM-I 599 Special Assignments (1 credit)

Core Electives (6 credits)

- 500 level or above CHEM-I courses in any of the areas: Analytical Chemistry, Biological Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, or Other Elective Courses as approved by Program Director/Mentor (e.g., CHEM-I 611); these courses must be outside the designated Major Area across two separate areas (i.e., 3 credits in each of the different areas).

MS Thesis Research (12 credits)

- CHEM-I 698 Research in MS Thesis

Major Area (9 credits): take at least 9 credits within one of the following major areas:

Analytical Chemistry

- CHEM-I 520 Forensic Chemistry I (3 cr.)
- CHEM-I 613 Mass Spectrometry (3 cr.)
- CHEM-I 619 Electroanalytical Chemistry (3 cr.)
- CHEM-I 621 Advanced Analytical Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Biological Chemistry

- CHEM-I 533 Introductory Biochemistry (3 cr.)
- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 636 Nucleic Acid Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)

- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Inorganic Chemistry

- CHEM-I 542 Inorganic Chemistry (3 cr.)
- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Organic Chemistry

- CHEM-I 610 Synthetic Medicinal Chemistry (3 cr.)
- CHEM-I 651 Advanced Organic Chemistry (3 cr.)
- CHEM-I 652 Synthetic Organic Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Physical Chemistry

- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

MS NON-THESIS

Core Electives (6 credits)

- 500 level or above CHEM-I courses in any of the areas: Analytical Chemistry, Biological Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, or Other Elective Courses as approved by Program Director/Mentor (e.g., CHEM-I 611); these courses must be outside the designated Major Area across two separate areas (i.e., 3 credits in each of the different areas).

Free Electives (15 credits)

- Take at least 15 credits in any 500 level CHEM course or above,
- May include up to 6 credits of CHEM-I 599 Special Assignments for mentored research with faculty approval

Major Area (9 credits): take at least 9 credits within one of the following major areas:

Analytical Chemistry

- CHEM-I 520 Forensic Chemistry I (3 cr.)
- CHEM-I 613 Mass Spectrometry (3 cr.)
- CHEM-I 619 Electroanalytical Chemistry (3 cr.)
- CHEM-I 621 Advanced Analytical Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Biological Chemistry

- CHEM-I 533 Introductory Biochemistry (3 cr.)
- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 636 Nucleic Acid Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Inorganic Chemistry

- CHEM-I 542 Inorganic Chemistry (3 cr.)

- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Organic Chemistry

- CHEM-I 610 Synthetic Medicinal Chemistry (3 cr.)
- CHEM-I 651 Advanced Organic Chemistry (3 cr.)
- CHEM-I 652 Synthetic Organic Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Physical Chemistry

- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Ph.D. in Chemistry and Chemical Biology

Program Description: The Ph.D. program in Chemistry is a full-time, thesis-based research program that provides a substantially larger research component than the M.S. degree. It requires original and significant research contributions by the student. As a result, a Ph.D. graduate is qualified for positions where the ability to design, develop, and carry out independent research is required.

To establish Ph.D. candidacy, students must pass three written Area Exams and complete other milestones (including a literature seminar and a research poster) within their first four semesters and pass an oral qualifying examination by the end of the fifth semester. The oral qualifying examination includes a discussion of the student's research progress and defense of an original research proposal distinct from the student's thesis research. The Ph.D. program requires 20 credit hours of coursework and 70 credit hours of thesis research. The course requirements include a seminar course (2 cr.), a core of three courses in the student's major area of chemistry (9 cr.) plus two additional courses in a minor area (6 cr.), as well as an additional course in a third area (3 cr.). Additional courses may be recommended to cover material relevant to the preliminary examinations.

Final Examination/Defense of Dissertation: Usually oral, covering dissertation, major, and minors, and also a seminar describing the dissertation.

Program Requirements

- Minimum GPA requirement for graduation: 3.0
- Minimum grade of B- for all listed coursework

Core Required Seminar (2 credits)

- CHEM-I 695 Seminar (2 credits)

Electives (3 credits)

- 500 level or above CHEM-I course in any of the areas: Analytical Chemistry, Biological Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, or Other Elective Courses as approved by Program Director/Mentor (e.g., CHEM-I 611); this course

must be outside the designated Major Area and the selected Minor area.

Minor Requirement (6 credits)

PhD Thesis Research (70 credits)

- CHEM-I 699 Research-PhD Thesis

Major Area (9 credits): take at least 9 credits within one of the following major areas:

Analytical Chemistry

- CHEM-I 520 Forensic Chemistry I (3 cr.)
- CHEM-I 613 Mass Spectrometry (3 cr.)
- CHEM-I 619 Electroanalytical Chemistry (3 cr.)
- CHEM-I 621 Advanced Analytical Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Biological Chemistry

- CHEM-I 533 Introductory Biochemistry (3 cr.)
- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 636 Nucleic Acid Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Inorganic Chemistry

- CHEM-I 542 Inorganic Chemistry (3 cr.)
- CHEM-I 632 Bioinorganic Chemistry (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Organic Chemistry

- CHEM-I 610 Synthetic Medicinal Chemistry (3 cr.)
- CHEM-I 651 Advanced Organic Chemistry (3 cr.)
- CHEM-I 652 Synthetic Organic Chemistry (3 cr.)
- CHEM-I 653 Organic Spectroscopy (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Physical Chemistry

- CHEM-I 635 Protein Structure and Function (3 cr.)
- CHEM-I 673 Biomaterials (3 cr.)
- CHEM-I 674 Biomimetics (3 cr.)
- CHEM-I 677 Computational Chemistry and Molecular Modeling (3 cr.)
- CHEM-I 696 Special Topics in Chemistry (3 cr.)

Chemistry and Chemical Biology Minors in the School of Science

Analytical and Bioanalytical Chemistry

This minor will leverage the existing expertise in analytical and bioanalytical chemistry at IU Indy. The minor will consist of a minimum of six credit hours. It will use an advanced analytic chemistry course as the required course and use three other analytical chemistry courses as potential electives. All courses have been approved and offered for many years.

Required courses:

- CHEM-I 621: Advanced Analytical Chemistry (3 cr.)

Elective courses:

- CHEM-I 520 Forensic Chemistry I (3 cr.)
- CHEM-I 613 Mass Spectrometry (3 cr.)
- CHEM-I 619 Electroanalytical Chemistry (3 cr.)

Molecular Biosciences

The PhD Minor in Molecular Biosciences will require a minimum of 6 credits which are obtained from taking one required course CHEM-I 635: Protein Structure and Function or CHEM-I 636: Nucleic Acids and one of four elective graduate courses within the same sub disciplinary area.

Required courses:

- CHEM-I 635: Protein Structure and Function (3 cr.)

or

- CHEM-I 636: Nucleic Acids (3 cr.)

Elective courses:

- CHEM-I 632: Bioinorganic Chemistry (3 cr.)
- CHEM-I 635: Protein Structure and Function (unless taken as a required course; 3 cr.)
- CHEM-I 636: Nucleic Acids (unless taken as a required course; 3 cr.)
- CHEM-I 673: Biomaterials (3 cr.)
- CHEM-I 674: Biomimetics (3 cr.)
- CHEM-I 677: Computational Chemistry and Molecular Modeling (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

CHEM-I 520 Forensic Chemistry I (3 cr.) This course will focus on the analysis and identification of commonly abused chemicals such as ethanol, controlled substances and prescription drugs. The history, legal issues, synthesis, chemical/physical properties, and laboratory analysis of these materials will be discussed. Special topics of the students choosing will also be included as student presentations.

CHEM-I 533 Introductory Biochemistry (3 cr.) P: CHEM-C 342 or equivalent. A rigorous one-semester introduction to biochemistry.

CHEM-I 542 Inorganic Chemistry (3 cr.) P: CHEM-C 362 or equivalent or consent of instructor. Atomic structure; periodic trends and properties of the elements. Introduction to symmetry and group theory. Valence bond, molecular orbital, and ligand field theories of bonding and their application to structure and properties of inorganic and organometallic compounds. Spectroscopic properties and acid-base, oxidation-reduction, and coordination reactions of inorganic compounds. Advanced topics in main group or transition element chemistry.

CHEM-I 575 Intermediate Physical Chemistry (3 cr.) P: CHEM-C 362 or equivalent. Quantum theory of atoms and molecules, theories of chemical bonding, molecular

spectroscopy, methods for determining molecular structure, and electrical and magnetic properties.

CHEM-I 590 Special Topics in Chemistry (3 cr.) Fall, Spring. Lecture courses offered on topic areas that are not part of the regular graduate curriculum. Repeatable up to 2 times.

CHEM-I 599 Special Assignments (0-4 cr.) P: Consent of instructor. Every semester including summer I and II, time arranged. Directed reading or special work not included in other courses.

CHEM-I 610 Synthetic Medicinal Chemistry (3 cr.) P: CHEM-C 342 Organic Chemistry Lectures II or equivalent with a C or better. This course bridges introductory undergraduate organic chemistry, advanced organic chemistry, and medicinal chemistry, covering classic organic reactions and their mechanisms. Application of these reactions to the synthesis of biologically active natural products and structurally complicated pharmaceuticals will be discussed along with the retro-synthetic strategy and their relevant mechanisms.

CHEM-I 613 Mass Spectrometry (3 cr.) A survey of mass spectrometry, including fundamentals of instrumentation, instrumentation types, and applications. Applications in biological and environmental chemistry are discussed.

CHEM-I 619 Electroanalytical Chemistry (3 cr.) This course is an introduction to the basic principles and theory of electrochemical phenomena and the methods used to study them. The course includes descriptive chemistry of electrochemical reactions and contemporary directions of research in electrochemistry.

CHEM-I 621 Advanced Analytical Chemistry (3 cr.) P: CHEM-C 310 and CHEM-C 410. A critical survey of recent developments in chemical and instrumental methods of analysis.

CHEM-I 629 Chromatographic Methods of Analysis (3 cr.) P: CHEM-C 410 or equivalent or consent of instructor. Principles and practice of modern gas and liquid chromatography and capillary electrophoresis are developed from an integrated point of view. Emphasis is placed both on theory and on features useful for practical analytical separations.

CHEM-I 632 Bioinorganic Chemistry (3 cr.) P: CHEM-C 430 Inorganic Chemistry or equivalent and CHEM-C 484 Biomolecules and Catabolism or equivalent. The role of essential metal ions in fundamental life processes ranges from structural, electron transfer to catalysis. This course will introduce techniques for probing the metal sites with a focus on transition metals. This course will discuss the occurrence and the effect of exposure to toxic metals.

CHEM-I 634 Biochemistry: Structural Aspects (3 cr.) P: CHEM-C 310, CHEM-C 342, CHEM-C 361, and CHEM-C 362 or equivalent. Chemistry of materials of biochemical interest: carbohydrates, lipids, proteins, amino acids, nucleic acids, porphyrins, biochemistry of blood.

CHEM-I 636 Nucleic Acid Chemistry (3 cr.) Nucleic Acids Chemistry focuses on the properties of nucleic acids that are of concern to chemists and molecular-minded life scientists. Following a series of lectures that relate fundamental attributes, focused topics will be presented

from the scientific literature to provide an understanding of current efforts concerning these vital biomolecules.

CHEM-I 641 Advanced Inorganic Chemistry (3 cr.) P: CHEM-C 430 or CHEM-I 542 or equivalent or consent of instructor. Applications of symmetry and group theory to structure, bonding and spectral properties of inorganic compounds. Advanced topics in main group and transition element chemistry including determination of structure from physical and spectroscopic properties, bonding in coordination, and organometallic compounds and inorganic reaction mechanisms.

CHEM-I 651 Advanced Organic Chemistry (3 cr.) P: CHEM-C 342 or equivalent. Modern structural organic chemistry. Introduction to bonding theory, stereochemistry, and computational chemistry.

CHEM-I 652 Synthetic Organic Chemistry (3 cr.) P: CHEM-I 651 or CHEM-I 657. An advanced treatment of methods for preparing major types of organic functionalities and bonds, stressing stereo- and regio-chemical control, and employing mechanistic organic chemistry for understanding choice of reagents and reactions conditions

CHEM-I 657 Reaction Mechanisms (3 cr.) P: CHEM-C 342 or equivalent or consent of instructor. Modern structural organic chemistry, introduction to physical organic chemistry, mechanisms of representative reactions, and methods used for understanding reactivity in organic transformations.

CHEM-I 672 Quantum Chemistry (3 cr.) P: One year of physical chemistry. Basic principles of classical and quantum mechanics, approximation methods, atomic structure, spectroscopy, application of group theory, and theory of molecular bonding.

CHEM-I 675 Chemical Kinetics (2-3 cr.) P: One year of physical chemistry. Experimental and theoretical considerations of chemical reaction rates and mechanisms.

CHEM-I 682 Statistical Thermodynamics (3 cr.) P: CHEM-C 362 or equivalent. Application of statistical mechanics to the description of imperfect gases, liquids, and solutions, and to order-disorder phenomena in solids and surfaces; Monte Carlo techniques and molecular dynamics.

CHEM-I 695 Seminar (0-1 cr.) Group meeting for review and discussion of important current literature in analytical, biological, inorganic, organic, and physical chemistry. Each graduate student is required to attend the seminar of his/her major subject.

CHEM-I 696 Special Topics in Chemistry (1-3 cr.) P: Bachelor of Science in chemistry from an accredited institution or consent of instructor. Lectures on selected topics of current interest.

CHEM-I 696 Special Topics In Chemistry: Bioanalytical Chemistry (3 cr.) Modern techniques for the study of biological macromolecules, such as protein and peptides, carbohydrates, DNA, RNA, and lipids, including (1) spectroscopy (UV-Vis, Raman, NMR, mass spectrometry, and light scattering); (2) bioseparations (chromatography, electrophoresis, and microdialysis); (3) electrochemistry (sensors, electron transfer, and LCEC); and (4)

miscellaneous topics (amino acid analysis, sequencing, microcalorimetry, and immunochemistry).

CHEM-I 696 Special Topics in Chemistry: Biochemistry-Dynamic Aspects (1-3 cr.) Mechanisms of biological catalysis, metabolism, biosynthesis, regulation of genetic information, and molecular biology.

CHEM-I 696 Special Topics in Chemistry: Bioelectrochemistry (1-3 cr.) Principles of electrochemical measurements including potentiometry, amperometry, and linear sweep and cyclic voltammetry and application to the study and utilization of biological molecules. Topics covered include redox transformations in biological systems, electron transfer between electrodes and biological molecules, and electrochemical sensors for detection and quantitation of biological analytes.

CHEM-I 696 Special Topics in Chemistry: Bioorganic Chemistry (1-3 cr.) Structure and reactivity of biological macromolecules, such as proteins, enzymes, and nucleic acids, and their relevance to bioorganic chemistry. Current experimental studies of enzymes, nucleic acids, and model systems.

CHEM-I 696 Special Topics in Chemistry: Biophysical Chemistry (1-3 cr.) The study of structure and properties of biologically important macromolecules in solution using physical techniques, with special emphasis on optical, fluorescence, and magnetic resonance spectroscopy to describe protein conformation, denaturation, catalytic center structure, thermodynamics of ligand binding, time dependent processes, and membrane properties.

CHEM-I 696 Special Topics in Chemistry: Chemical Information Technology (1-3 cr.) Overview of chemical informatics techniques, including chemical information and data systems, chemical structure and data representation and search systems, and bioinformatics techniques.

CHEM-I 696 Special Topics in Chemistry: Organometallics in Organic Synthesis (1-3 cr.) Recent developments in the use of transition metals in synthetic organic methodology. Emphasis is placed on applications of methods in the synthesis of complex organic molecules.

CHEM-I 696 Special Topics in Chemistry: Group Theory in Chemistry (1-3 cr.) This course is on molecular symmetry and how we obtain information about the quantum states of molecules through application of group theoretical techniques related to the symmetries of molecules.

CHEM-I 696 Special Topics in Chemistry: Solid-Phase Synthesis and Combinatorial Chemistry: Theory and Practice (1-3 cr.) This course will explore how the tools of solid-phase synthesis and combinatorial chemistry are being used to solve a wide variety of problems requiring chemical solutions. Examples range from medicinal chemistry and drug discovery to new catalyst creation, from new "chiral selectors" to new biochemical probes. The course will focus on the rationale for employing a combinatorial approach in chemical discovery. It will teach the basics of solid-phase organic chemistry, and the methodology, equipment, and analytical technology employed to use it as a tool to rapidly and effectively carry out a combinatorial approach to problem solving.

CHEM-I 698 Research M.S. Thesis (variable cr.)
Research M.S. Thesis

CHEM-I 699 Research Ph.D. Thesis (variable cr.)
Research Ph.D. Thesis

CHEM-I 634 Biochemistry: Structural Aspects (3 cr.) P: CHEM-C 310, CHEM-C 342, CHEM-C 361, and CHEM-C 362 or equivalent. Chemistry of materials of biochemical interest: carbohydrates, lipids, proteins, amino acids, nucleic acids, porphyrins, biochemistry of blood.

CHEM-I 673 Biomaterials (3 cr.) The course provides an introduction into the fascinating world of biomaterials science. Students learn how concepts of polymer chemistry and interfacial chemistry are linked with those of materials science, biomedical engineering, and biology to develop biomaterials for various medical applications.

CHEM-I 674 Biomimetics (3 cr.) The course focuses on biomimetic systems and their role in biophysical and bioanalytical applications. The principle concepts of biomimetics are first outlined in a series of lectures before students are asked to review and discuss recent scientific literature related to this research field.

CHEM-I 611 Methods in Science Education Research (3 cr.) The course will explore the various research methods in science education research. Qualitative, quantitative, and mixed methods research designs will be introduced. Students will apply the knowledge obtained to design a study, collect, and analyze data using one of these methodologies.

CHEM-I 530 Instrumental Analysis of Trace Evidence (3 cr.) P: Prerequisite: FIS and Biology and Chemistry Graduate students. This course will focus on instrumental analysis of trace evidence. Mass spectrometry, chromatography, FT-IR, Raman, SEM-EDX, XRF, and microspectrophotometry will be covered. The application of these techniques to the analysis of toxicological samples and trace evidence (fibers, paint, ignitable liquids, explosives, gunshot residue, and glass) will also be covered.

CHEM-I 677 Computational Chemistry & Molecular Modeling (3 cr.) P: Undergraduate physical chemistry or consent of instructor. This course introduces essential theoretical background of computational chemistry. Molecular modeling tasks are used to solve chemical problems. Contents include molecular visualization, molecular mechanics, molecular orbital/density functional theory, geometry optimization, transition state theory, molecular dynamics, combined quantum mechanical/ molecular mechanical (QM/MM) approach, structure-activity relationships, basic docking and introductory sequence alignment techniques.

CHEM-I 652 Organic Spectroscopy (3 cr.) Competence in organic chemistry at a sophomore level (CHEM-C 341 / CHEM-C 342) is essential, particularly the concepts of periodicity, structure, substituent effects, and acidity. Application of modern analytical techniques including 1-D and 2-D nuclear magnetic resonance (NMR) spectroscopy, infrared spectroscopy, and mass spectrometry to the rational identification of organic structures.

Clinical Research

School of Medicine

Departmental URL: indianactsi.org/researchers/education-training/clinical-research-graduate-programs

[Clinical Investigation & Translational Education \(CITE\) Program – Indiana CTSI](#)

Program Directors: Professor Kurt Kroenke, Professor Brian Overholser

Curriculum

Courses

Degrees Offered

Master of Science, Graduate Certificate, PhD Minor

Master of Science in Clinical Research

Indiana University's Master of Science in Clinical Research degree program prepares health care professionals for a career in clinical research. This program offers a combination of course work and practical research experience and is a core component of the Indiana Clinical and Translational Sciences Institute (CTSI). The program also constitutes the formal didactic requirements for certain types of federal training grants (such as NIH K and T awards) as well as non-federal training programs. Following completion of the program, graduates can embark on a career in clinical research with the skills necessary to successfully complete for grant funding, conduct and analyze research findings, and publish work in scientific journals.

Admissions Requirements

Applicants to the MS/Certificate in Clinical Research program must currently be enrolled in or have completed a post-doctoral or equivalent program. Trainees need to have an arrangement with a research project within the Indiana University Indianapolis campus.

Applicants must meet the minimum requirements for acceptance as set by the Graduate School. These include but are not limited to holding a cumulative minimum GPA of 3.0 or better on previous coursework, sending official transcripts, and interviewing with the department head.

Course Requirements

The Master of Science program is divided equally between two main components: (1) completion of the formal curriculum and (2) active involvement in clinical research under the mentorship of a faculty scientist. Both elements are critical in preparation of the candidate for successful research following graduation. The curriculum is designed to cover core competency areas through a combination of course work and mentored research. The two-year M.S. program consists of a 30-credit hour curriculum, which includes the following core courses:

- Core Courses (take at least 12 credits)
 - GRDM-G504 Introduction to Research Ethics
 - GRDM-G660 Clinical Research Methods
 - GRDM-G661 Clinical Trials
- Research Course (3 credits)
 - GRDM-G664 Mentored Clinical Research
- General Electives (take at least 9 credits).

- PBHL-B 561 Introduction to Biostatistics
- PBHL-P 551 Biostatistics for Public Health
- approved electives

Grades

A minimum grade of B minus is required in all core courses, and an overall grade point average of 3.0 is required.

Thesis

Research project (see GRDM-G664 Mentored Clinical Research) is completed in lieu of thesis.

Graduate Certificate in Clinical Research

This Certificate consists of a 14-credit hour curriculum, which includes:

- Core Courses
 - GRDM-G 660 Clinical Research Methods
 - GRDM-G 504 Introduction to Research Methods
 - Choose one of the following:
 - GRDM-G661 Clinical Trials
 - PBHL-B 561 Introduction to Biostatistics
 - PBHL-P 551 Biostatistics for Public Health
- Electives (5-7 cr.) (to be approved by program director) include graduate-level courses in advanced biostatistics, epidemiology, clinical pharmacology, genetics, molecular biology, computer sciences, or other courses relevant to the individual student's field of clinical research.

Grades

A minimum grade of B minus is required in all core courses, and an overall grade point average of 3.0 is required.

Ph.D. Minor in Clinical Research

The 12-credit PhD Minor in Clinical Research is designed to be of service to a diverse clientele. It will provide PhD students with an overview of clinical research by introducing them to core clinical research concepts and skills, including clinical research methodology, clinical trials, research ethics, and biostatistics. Additionally, each student will complete one elective relevant to their specific area of research interest.

The Clinical Research Minor includes 9 credit hours of core coursework selected from the following list, and one 3-credit graduate level elective:

- Clinical Research Methods – GRDM-G660 Clinical Research Methods
- Clinical Trials – GRDM-G661 Clinical Trials
- Introduction to Research Ethics – GRDM-G504 Introduction to Research Methods
- PBHL-B 561 Introduction to Biostatistics
- PBHL-P 551 Biostatistics for Public Health
 - or alternate biostatistics course.

Elective courses will be approved by the Minor program director in conjunction with the student's PhD program advisor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Description

GRDM-G 504 Intro to Research Ethics (2-3 cr.) An introduction to both the theory and practice of research ethics. The course also covers key ethical principles and concepts.

GRDM-G 660 Clinical Research Methods (3 cr.) This course provides instruction in the major types of study design (other than clinical trials) used in clinical research, including cohort, case-control, cross-sectional, survey, and secondary database studies. Also, fundamental themes and special topics in clinical research are covered.

GRDM-G 661 Clinical Trials (3 cr.) This course includes topics in conducting clinical trials, including design, recruitment, informed consent, randomization, blinding, data collection and analysis, safety monitoring, study closeout, and alternative designs such as crossover and nonrandomized trials. Some important research areas besides clinical trials are also covered.

GRDM-G 664 Mentored Clinical Research (7-9 cr.) This is an organized research project in the form of a scientific contribution or comprehensive analysis conducted under the mentorship of a faculty scientist from the individual CITE enrollee's core discipline. The capstone experience is submission of an abstract to a scientific meeting and completion of a first-authored paper deemed suitable for publication in a scientific journal.

PBHL-B 561 Introduction to Biostatistics I (3 cr.) B561 is an introductory level biostatistics course designed for healthcare professionals. This course will cover the topics on data presentation techniques, describing data with numerical summary measures, probability and probability distributions, sampling distributions, statistical inferences from small and large samples, analysis of categorical data, analysis of variance, correlation, and simple linear regression analysis.

PBHL-P 551: Biostatistics for Public Health I This course introduces the principles and methods of data analysis using R studio in public health biostatistics. Emphasizing public health examples as they relate to concepts like sampling, study design, descriptive statistics, probability, statistical distributions, estimation, hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation.

Courses

Course Descriptions

CSCI-B 503 ALGORITHMS DESIGN AND ANALYSIS (3 cr.) Models, algorithms, recurrences, summations, growth rates. Probabilistic tools, upper and lower bounds; worst-case and average-case analysis, amortized analysis, dynamization. Comparison-based algorithms: search, selection, sorting, hashing. Information extraction algorithms (graphs, databases). Graphs algorithms:

spanning trees, shortest paths, connectivity, depth-first search, breadth-first search.

CSCI-B 504 INTRODUCTION TO CRYPTOGRAPHY (3 cr.) The course provides students with a foundational introduction to cryptography. Students learn the basic primitives used in cryptography such as symmetric encryption, public-key encryption, message authentication codes, digital signatures, cryptographic hashes and related material. Computational aspects of modern cryptography are stressed, as are appropriate security models, and computational security reductions.

CSCI-B 516 ENGINEERING CLOUD COMPUTING (3 cr.) This course covers cloud system architectures, emphasizing network architectures, server and storage virtualization, data center topologies, and mobile cloud computing, building on knowledge of computer architectures, networks, and operating systems. While honing their research skills, students study cloud systems' trustworthiness, including security and privacy, and related economics, laws, and regulations.

CSCI-B 522 PROGRAMMING LANGUAGE FOUNDATIONS (3 cr.) Introduction to denotational, operational, and axiomatic approaches to programming language semantics. Semantic analysis of major programming language features. Logics of programs.

CSCI-B 543 COMPUTER ARCHITECTURE (3 cr.) Prerequisites: (CSCI-C 335 and CSCI-C 343) and (ECE 36500 or CS 40200) Fundamentals of computer design, instruction processing and performance analysis. Architecture of single-processor systems, focusing on pipelining, memory and memory hierarchies, and interconnect technology. Exploration of architecture classes such as high-performance multiprocessors, massively parallel computers, embedded systems.

CSCI-B 547 SYST&PROTOCOL SECUR&INFO ASSUR (3 cr.) This course covers the design and analysis of secure systems, including identifying security goals and risks, threat modeling, defense, integrating different technologies to achieve security goals, developing security protocols and policies, implementing security protocols and secure coding. Some real world scenarios that have many security requirements will be studied.

CSCI-B 551 ELEM ARTIFICIAL INTELLIGENCE (3 cr.) Introduction to major issues and approaches in artificial intelligence. Principles of reactive, goal-based, and utility-based agents. Problem-solving and search. Knowledge representation and design of representational vocabularies. Inference and theorem proving, reasoning under uncertainty, planning. Overview of machine learning.

CSCI-B 555 MACHINE LEARNING (3 cr.) Theory and practice of constructing algorithms that learn functions and choose optimal decisions from data and knowledge. Topics include: mathematical/probabilistic foundations, MAP classification/regression, linear and logistic regression, neural networks, support vector machines, Bayesian networks, tree models, committee machines, kernel functions, EM, density estimation, accuracy estimation, normalization, model selection.

CSCI-B 559 EFFICIENT AI (3 cr.) Prerequisite: CSCI-B 503 AND (CSCI-B 551 OR CSCI-B 555 OR CSCI-P 558

OR INFO-H 515 OR INFO-H 518) This course covers efficient artificial intelligence theories and techniques for designing advanced machine learning models. The goal is to optimize architecture, implementation, performance, power, memory, and time. Students learn efficient AI theories, patterns in AI, critical pattern determination, AI complexity, AI optimization, large deep models, real-time inference, and practical applications.

CSCI-B 561 ADVANCED DATABASE CONCEPTS (3 cr.) Database models and systems: especially relational and object-oriented; relational database design theory; structures for efficient data access; query languages and processing; database applications development; views. Transaction management: concurrency and recovery.

CSCI-B 565 DATA MINING (3 cr.) Algorithmic and practical aspects of discovering patterns and relationships in large databases. The course also provides hands-on experience in data analysis, clustering and prediction. Topics include: data preprocessing and exploration, data warehousing, association rule mining, classification and regression, clustering, anomaly detection, human factors and social issues in data mining.

CSCI-B 570 WIRELESS AND MOBILE SECURITY (3 cr.) Prerequisite: CSCI-P 538 or CSCI 53600 This course covers challenges and strategies for safeguarding wireless and mobile systems. Students learn to identify, assess, and mitigate security risks, including authentication and authorization, distributed denial of service, jamming, malware injection, and side-channel attacks. Topics include security for blockchain, machine learning, mobile crowdsourcing, Internet of Things, and voice-controlled systems.

CSCI-B 575 QUANTUM COMPUTING & APPLICATIONS (3 cr.) This course introduces quantum computing, including single and multiple-qubit systems; quantum states, superposition, measurements, and entanglement; and quantum gates and circuits. Students learn principles of quantum algorithms like Simon's, Shor's factorization, and Grover's search. Topics may include quantum information, programming, hardware, and cryptography and machine learning applications.

CSCI-B 577 SECURITY ENGINEERING (3 cr.) This course covers a broad range of topics in system security engineering, including authentication and authorization, cryptography, architectures, detection systems, quantum computing security, risk assessment, social engineering, strategic policy, and trustworthy hardware. Students conduct research activities, such as selecting research topics, writing papers, and presenting their results.

CSCI-B 649 TOPICS IN SYSTEMS (1-6 cr.) Special topics in systems.

CSCI-B 651 NATURAL LANGUAGE PROCESSING (3 cr.) Prerequisite: CSCI-B 551 or CSCI-B 555 or CSCI-B 565 or INFO-H 515 Theory and methods for natural language processing. Algorithms for sentence parsing and generation. Context-free and unification grammars. Question-and-answer systems. Analysis of narratives. Finite-state approaches to computational phonology and morphology. Machine translation. Machine learning of natural language. Speech recognition. Neural-network and statistical alternatives to symbolic approaches.

CSCI-B 654 EXPLAINABLE AI (3 cr.) Prerequisites: CSCI-B 551 or CSCI-B 555 or CSCI-P 558 or INFO-H 515 or INFO-H 518 This course covers explainable artificial intelligence methodologies and techniques for effective model building. The goal is to leverage explainability design principles to build powerful, complex, and transparent models. Students learn methodologies, parametric models, nonparametric models, deep learning complexity, activation and saliency maps, attention and transformer, compliance and ethics, and applications.

CSCI-B 655 PATTERN RECOGNITION (3 cr.) This course covers pattern recognition and machine learning techniques. Topics include Bayesian decision theory, clustering, component analysis, hidden Markov models, linear discriminant functions, maximum-likelihood and Bayesian parameter estimation, neural networks, nonparametric techniques, stochastic methods, and unsupervised learning.

CSCI-B 657 COMPUTER VISION (3 cr.) Concepts and methods of machine vision as a branch of artificial intelligence. Basics of digital image processing. Local and global tools for deriving information from image data. Model-based object recognition and scene understanding.

CSCI-B 658 TRUSTWORTHY CAUSAL AI (3 cr.) This course explores how causal methods enhance AI-model trustworthiness. Students apply causal models to represent cause-effect relationships governing human understanding, improving generalization to novel data and yielding fairer, more interpretable results. Topics include AI robustness, privacy, safety, and accountability; tradeoffs among assumptions; associational, causal, and counterfactual conclusions; and trustworthiness architectures.

CSCI-B 659 TOPICS ARTIFICIAL INTELLIGENCE (1-6 cr.) Special topics in artificial intelligence.

CSCI-G 901 ADVANCED RESEARCH (6 cr.) Available to graduate students who have completed all course requirements for their doctorates, have passed doctoral qualifying examinations, and have the requisite number of degree credit hours, this course provides the advanced research student with a forum for sharing ideas and problems under the supervision of a senior researcher.

CSCI-P 532 OBJECT-ORIENTED SOFTWARE DEVELOPMENT (3 cr.) This course will help turn motivated students into superior contributors to any small- to mid-sized commercial or open-source software project. It takes a hands-on, learning-by-doing approach. Students are introduced to design patterns, tools, and teamwork strategies from the first assignment to the last project.

CSCI-P 536 ADVANCED OPERATING SYSTEMS (3 cr.) Advanced topics in operating systems, such as: multi-tasking, synchronization mechanisms, distributed system architecture, client-server models, distributed mutual exclusion and concurrency control, agreement protocols, load balancing, failure recovery, fault tolerance, cryptography, multiprocessor operating systems.

CSCI-P 538 COMPUTER NETWORKS (3 cr.) Layered TCP/IP architecture. LAN technologies (Ethernet, wireless, token rings). Switching. Internet addressing (IPv4, IPv6). Routing protocols. Congestion control (TCP, UDP). Applications (DNS, HTTP, peer-to-peer

networks). Selection of topics including DHCP, ICMP, VPNs, multicast, security.

CSCI-P 539 SENSOR NETWORKS AND IOT (3 cr.) P: CSCI-P 536 or CSCI-P 538 This course covers principles of wireless sensor networks and the Internet of Things. Students learn to design and analyze sensor networks and their applications. Topics include sensor network architectures, MAC layer, routing, data dissemination, transport protocols, operating systems, programming, querying, management, and applications.

CSCI-P 558 DEEP LEARNING (3 cr.) P: CSCI 57800 OR CSCI-B 551 OR CSCI-B 555 OR CSCI-B 565 OR INFO-H 510 OR INFO-H 515 This course covers deep learning neural networks. Topics include logistic regression, feedforward networks, autoencoders, convolutional neural networks, recurrent neural networks, graph neural networks, deep generative models, adversarial and reinforcement learning, and optimization and regularization techniques. Students also delve into recent research and learn through projects to develop deep learning systems.

CSCI-P 565 SOFTWARE ENGINEERING I (3 cr.) Analysis, design and implementation of software systems. Requirements specification: data and process modeling. Software design methodologies. Software quality assurance: testing and verification. Software development processes.

CSCI-P 566 SOFTWARE ENGINEERING II (3 cr.) P: CSCI-P 565 Analysis, design and implementation of software systems. Requirements specification: data and process modeling. Software design methodologies. Software quality assurance: testing and verification. Software development processes.

CSCI-P 567 SOFTWARE QUALITY ASSURANCE (3 cr.) This course covers software testing best practices for developing high-quality software systems. Students learn traditional software testing methods, such as functional, structural, and integration testing. They also survey contemporary methods, such as exploratory, model-based, search-based, and non-functional testing. Students apply software testing methods to several programming projects.

CSCI-P 583 DATA VISUALIZATION (3 cr.) This course covers the theory, design, and application of scientific and information visualization, including algorithm design and implementation. Students learn to represent multidimensional data using computer graphics and other techniques, enabling users to interact with it. Projects span biomedical data analysis, scientific and engineering simulations, and visual web data mining.

CSCI-T 530 INTRODUCTION TO INFORMATICS (3 cr.) This intensive course introduces core informatics tools and methods: SQL, data structures, optimization, data visualization, simulation modeling, probabilistic and statistical reasoning, and machine learning. It combines SQL for data management with Python for data processing, statistical analysis, visualization, and introductory machine-learning workflows.

CSCI-Y 790 GRADUATE INDEPENDENT STUDY (1-6 cr.) Independent study under the direction of a faculty member, culminating in a written report.

CSCI-Y 791 GRAD INDEPENDENT SYSTEM DEV (1-6 cr.) System development culminating in written report and a publicly available system.

CSCI-Y 890 THESIS READINGS AND RESEARCH (1-12 cr.) Research under the direction of a member of the graduate faculty leading to a PhD dissertation.

DSOI-D 501 INTRO DATA SCIENCE PROGRAMMING (3 cr.) This course covers how to develop and test object-oriented programs for data science applications, including classification and approximation. Students learn to design simulations, determine algorithm complexity, test hypotheses, and evaluate reliability and validity. Topics include clustering, decision trees, graph optimization, histograms, linear regression, plotting, probability, and sampling.

DSOI-D 502 MODELING CRISIS (1-3 cr.) Models employed by geographic information systems characterize the physical, economic, social, and environmental impact of natural and human caused disasters. This course surveys geospatial models and their capabilities and technologies. Students learn to use models for disaster mitigation, preparedness, and response. The course prepares students for research on modeling crisis.

DSOI-D 510 STATISTICS FOR DATA SCIENCE (3 cr.) This course introduces statistical inference for big data. It covers distributions, confidence intervals, hypothesis testing, ANOVA, linear models, bias, model critique, and effective data communication. Students learn data analysis, wrangling, and visualization through hands-on programming projects.

DSOI-D 515 STATISTICAL LEARNING (3 cr.) P: ECON-E 570 or HPER-T 591 or KINE-T 591 or PBHL-B 551 or PBHL-B 561 or PSY-I600 or STAT-I511 This course applies statistical learning methods for data mining and inferential and predictive analytics to informatics-related fields. The course also covers techniques for exploring and visualizing data, assessing model accuracy, and weighing the merits of different methods for a given real-world application. This course is an essential toolset for transforming large, complex informatics datasets into actionable knowledge.

DSOI-D 516 CLOUD COMPUTING FOR DATA SCI (3 cr.) P: INFO I501 and (CSCI 54100, LIS S519, INFO B512, or INFO B556) This course covers data science concepts, techniques, and tools to support big data analytics, including cloud computing, parallel algorithms, nonrelational databases, and high-level language support. The course applies the MapReduce programming model and virtual-machine utility computing environments to data-driven discovery and scalable data processing for scientific applications.

DSOI-D 517 VISUALIZATION DES, ANLS & EVAL (3 cr.) This is an introductory course in design and evaluation of interactive visualizations for data analysis. Topics include human visual perception, visualization design, interaction techniques, and evaluation methods. Students develop projects to create their own web-based visualizations and develop competence to undertake independent research in visualization and visual analytics.

DSOI-D 518 DEEP LEARNING NEURAL NETWORKS (3 cr.) Prerequisite is at least one of the following:

INFO-H 501 or CSCI-B 503 or INFO-B 573 or INFO-H 516 or DSCI-D 516 Deep learning has resurged with the availability of massive datasets and affordable computing, enabling new applications in computer vision and natural language processing. This course introduces convolutional, recurrent, and other neural network architectures for deep learning. Students design, implement, and train these models to solve real-world problems.

DSCI-D 519 NAT LANG PROC WITH DEEP LEARN (3 cr.) P: INFO-I 501 and (INFO-H 515 or DSCI-D 515 or INFO-B 529) This course covers natural language processing using deep learning and its applications. Students learn recent advances by evaluating the literature, implementing methods in Python, and conducting a research project. Topics include machine translation, automated image captioning, and document summarization.

DSCI-D 611 MATHEMATICAL & LOGICAL FNDTNS-INFO (3 cr.) An introduction to mathematical methods for information modeling, analysis, and manipulation. The topics include proof methods in mathematics, models or computation, counting techniques and discrete probability, optimization, statistical inference and core advanced topics that include, but are not limited to, Markov chains and random walks, random graphs, and Fourier analysis.

DSCI-D 695 THESIS/PROJECT IN DATA SCIENCE (1-6 cr.) P: INFO-I575 or LIS-S506 or another approved graduate-level course on research design and methods The student prepares and presents a thesis or project in applied data science. The thesis is a substantial multi-chapter paper or carefully designed and evaluated application, based on well-planned research or a scholarly project. Details are worked out between the student and an advising faculty member.

INFO-H 537 Legal and Social Informatics of Security (3 cr.) This is a case-based course on privacy and security in social contexts. Cases will particularly address the specific designs of technologies (e.g., P3P, PICS) and discuss how different technically feasible design choices would result in distinct regulatory regimes, business strategies, or support different forms of social interaction. This course will focus on specific security and privacy technologies as socio-technical systems.

INFO-H 541 Interaction Design Practice (3 cr.) Human-computer interaction design (HCID) describes the way a person or group accomplishes tasks with a computer: what the individual or group does and how the computer responds; what the computer does and how the individual or group responds. Sometimes known as 'interface design,' HCID becomes increasingly important as computing intelligence and connectivity spread ubiquitously to home, work, and play environments. This course will be organized around a collection of readings and several design projects concerned with applying human-computer interaction principles to the design, selection, and evaluation of interactive systems.

INFO-H 543 Interaction Design Methods (3 cr.) Students will learn basic concepts and methods for usability studies and evaluation of interactive systems as well as apply those methods to actual system design evaluations. This course is not only for understanding the basics and traditional approaches in this area, but

also for exploring new ways of evaluating the usability of state-of-the-art technology-based systems such as systems in ubiquitous computing, CSCW, tangible and social computing areas.

INFO-H 554 Independent Study in Human-Computer Interaction (1-3 cr.) Independent study under the direction of a faculty member, culminating in a written report. May be repeated for credit. Total credit for seminars and independent study courses may not exceed nine 9 hours.

INFO-H 559 Media and Technology Entrepreneurship (3 cr.) This course covers legal and business aspects of starting a media or technology company, including selecting the business structure, financing and credit, drafting business plans, articles of incorporation, and bylaws, tax implications, marketing and public relations, shareholders and governance, bankruptcy, insurance, contracts, property, and working with attorneys, accountants, and insurance agents.

INFO-H 561 Meaning and Form in HCI (3 cr.) As a continuation of HCI1 (H541), students will learn methodologies and principles for two types of core activities in human-computer interaction design: a) requirements analysis, contextual inquiry and ethnography as applied to the design of interactive systems in the social context? b) conceptual design for the modeling of the interactive structure of web, hypermedia and software applications. Weekly readings on the text books will be integrated with academic and professional articles and online media.

INFO-H 563 Psychology of Human Computer Interaction (3 cr.) Covers the psychological and behavioral science of human computer interaction, including cognitive architecture, memory, problem-solving, mental models, perception, action, and language. Emphasis is placed on developing an understanding of the interaction between human and machine systems and how these processes impact the design and testing of interactive technologies.

INFO-H 564 Prototyping for Interactive Systems (3 cr.) The course covers methodologies for designing and prototyping graphic user interfaces, including rapid (paper) and dynamic (interactive) prototypes. Principles of design research and visual communication are discussed in the context of interaction design, cognition and user behavior, as well as usability testing techniques for concept validation.

INFO-H 624 Advanced Seminar I—Human-Computer Interaction (3 cr.) P: Advanced graduate standing or consent of instructor. Introduces students to major historical, contemporary, and emerging theories, methods, techniques, technologies, and applications in the field of human-computer interaction. Students will explore relevant and influential research, results, and application. Students will design an independent research program in relation to their individual research fields and personal interests.

INFO-H 634 Advanced Seminar II – Human Computer Interaction (3 cr.) P: Advanced graduate standing or consent of instructor. Introduces students to major historical, contemporary, and emerging theories, methods,

techniques, technologies, and applications in the field of human-computer interaction. Students will explore relevant and influential research, results, and applications. Students will develop an understanding of leading research approaches and paradigms, and will design an independent research program in relation to their individual research fields and personal interests.

INFO-H 680 Human-Computer Interaction Professional Practice I (3 cr.) P: INFO H541, H561, H543, H563, H564 This course represents Part One of a two-part course series, which fulfills the final HCI MS project requirement. Part One should showcase the accumulative knowledge of the student in the areas of product design and development. Students will explore relevant and applied research concepts, while considering various HCI design approaches. Final outcomes will include the completion of the first half of the final project, i.e., the completion of a final product.

INFO-H 681 Human Computer Interaction Professional Practice II (3 cr.) P: INFO H680 This course represents part two of a two-part course series, which fulfills the final HCI MS project requirement. The project will showcase the accumulative knowledge of the student in the areas of product assessment and documentation. Final outcomes will include the completion of the second half of the final project, i.e. product testing and analysis and writing of the paper.

INFO-H 694 Thesis/Project in Human-Computer Interaction (1-6 cr.) The student prepares and presents a thesis or project in an area of human-computer interaction. The product is substantial, typically multi-chapter paper, or a carefully designed and evaluated application, based on well-planned research or scholarly project. Details are worked out between the student and sponsoring faculty member.

INFO-I 575 Informatics Research Design (3 cr.) Full spectrum of research concepts, designs, and methodologies used in informatics research, from quantitative to qualitative research; from deterministic, hypothesis-driven experimental designs to a posteriori discovery through data mining. Philosophical foundations to practical applications. Provides the conceptual framework in which the informatics graduate student may develop their own research agenda.

INFO-I 595 Professional Internship (1-6 cr.) An experiential learning course where students apply classroom theory and learning in degree-related work experience under the supervision of a mentoring supervisor and course instructor.

INFO-I 600 Professionalism and Pedagogy in Informatics (3 cr.) This course introduces students to topics and skills necessary for entering careers in industry or the academy. Topics covered include career planning, curriculum development, effective teaching, research ethics, scholarly and trade publishing, grantsmanship, and intellectual property consideration.

INFO-I 690 Topics in Informatics (3 cr.) Variable topic. Emphasis on new developments and research in informatics. Course is intended for Ph.D. students in the School of Informatics. Can be repeated with different topics, subject to approval of the dean.

INFO-I 698 Research in Informatics (1-12 cr.) Research under the direction of a member of the graduate faculty that is not dissertation related. Can be repeated for credit for a total of 30 credit hours.

INFO-I 699 Independent Study in Informatics (1-3 cr.) Independent readings and research for Ph.D. students under the direction of a faculty member, culminating in a written report. May be repeated for a maximum of 12 credit hours.

INFO-I 790 Informatics Research Rotation (3 cr.) Work with faculty, investigate research opportunities. Can be repeated for a total of 6 credit hours.

INFO-I 890 Thesis Readings and Research (1-12 cr.) Research under the direction of a member of the graduate faculty leading to a Ph.D. dissertation. Can be repeated for credit for a total of 30 credit hours.

LIS-S 608 COMMUNITY ANALYSIS AND ENGAGEMENT STRATEGIES (3 cr.)

Lis-s 609 COMMUNITY ENGAGED RESEARCH (3 CR.)

LIS-S 690 INFO SCI RESEARCH SEMINAR I (3 cr.) This course cultivates advanced research skills and a profound understanding of historical and contemporary information science issues by exploring information organization, retrieval, and human-computer interaction. The course equips students with critical analysis skills and encourages their development of research interests in information and library science.

LIS-S 691 INFO SCI RESEARCH SEMINAR II (3 cr.) P:

LIS-S 690 This second introductory doctoral course provides an in-depth exploration of the seminal works in the three prominent areas of information science: information retrieval, bibliometrics, and information behavior. This exploration connects foundations in information science to the emerging fields of community informatics and community-engaged research.

Dentistry

School of Dentistry

Departmental email: dsgrad@iu.edu

Departmental URL: <https://dentistry.iu.edu/academics/degrees-programs/Ph.D./index.html>

Curriculum

Courses

Degrees Offered

Dental Sciences Ph.D.

Doctor of Philosophy (Ph.D.) Degree in Dental Science

The objective of the Ph.D. in Dental Science Program is to provide a core curriculum and in-depth research training that offers a solid base for a career in research and/or teaching in the dental sciences and beyond. The Ph.D. degree in Dental Science focuses on basic and clinical science areas, including oral biology, preventative dentistry, and dental materials and beyond as they relate to the human organism and biological systems. Graduates of this program are ideal candidates for academic research and/or teaching positions in dental schools, medical schools, and other basic science departments as

well as for research positions in government institutions and industry.

Degree Requirements

The degree requires 90 credit hours including 12 credits in a minor.

The Ph.D. contains courses in biostatistics, research ethics, research communications, and effective teaching methods. The course in biostatistics emphasizes the important role of appropriate statistical methods used in biological research. The research ethics course addresses the importance of a strong ethical approach to the scientific method and human and animal research. Research Communications is a multidisciplinary course that will increase the ability of the student to write and review scientific papers. The teaching methods courses recognize that most of our students will ultimately teach in an academic environment and may have no previous course work in education.

All general requirements of Graduate School apply to the Ph.D. in Dental Science Program, plus specific requirements of the program as outlined in the core curricula below.

Admission Requirements

The program is open to individuals who have earned the Doctor of Dental Surgery degree or its equivalent as well as graduates of Bachelor of Science degree programs. Applicants must have a minimum grade point average of 3.0 or higher on a 4.0 scale (grade point averages from the dental degree in the case of dental school graduates). Applicants for the Ph.D. degree program must have a minimum score on the Graduate Record Examination (GRE) of #160 in the verbal, 148 in the quantitative, or 3.0 in the analytical section.

Program Requirements

The degree requires 90 credit hours with 32–40 required course credits (depending on the choice of track) and 12 credits in a minor with a minimum grade of B-. Disciplines included in the program are anatomy, biochemistry, microbiology, molecular biology, cell biology, bone biology, chemistry, immunology, neuroscience, pathology, physiology, public health, biomedical engineering, biostatistics, and materials science engineering. Students are also required to enroll in the IU Indianapolis [Preparing Future Faculty and Professionals \(PFFP\)](#) program. Descriptions of the following courses that do not appear on the list of graduate courses in this bulletin can be found in this bulletin or in the School of Medicine or School of Education bulletin. The requirements of this degree are as follows:

Core Curriculum: Curriculum

- General Ph.D. Courses (at least 10 credits required)
 - Statistics (choose one)
 - PBHL-B 561 INTRODUCTION TO BIOSTATISTICS I
 - PBHL-P 551 BIOSTATISTICS FOR PUBLIC HEALTH I
 - Research Ethics (choose one)
 - GRDM-G 504 INTRODUCTION TO RESEARCH ETHICS
 - GRDM-G 505 THE RESPONSIBLE CONDUCT OF RESEARCH
 - DENT-D 505 FUNDAMENTALS OF ETHICS AND PROFESSIONALISM
- Research communications
 - GRDM-G 655 RESEARCH COMMUNICATIONS SEMINAR
- Elective (choose one)
 - EDUC-J 500 INSTRUCTION IN THE CONTEXT OF CURRICULUM
 - PSY-I 608 MEASUREMENT THEORY AND THE INTERPRETATION OF DATA
 - ENG-W 531 DESIGNING AND EDITING VISUAL TECHNICAL COMMUNICATION
 - DENT-R 956 CURRENT TOPICS IN ORAL BIOLOGY
- Seminar Courses (3 credits)
 - IUSD Seminar (choose one)
 - DENT-G 959 ORAL MICROBIOLOGY
 - DENT-G 910 PREVENTATIVE DENTISTRY
 - DENT-G 910 DENTAL MATERIALS
 - Non-IUSD Seminar (Choose two non-seminar courses from a course set manually defined by the institution)
- D. Research Courses (at least 40 credits)
 - DENT-R 957 INTRODUCTION TO RESEARCH IN ORAL BIOLOGY
 - Choose one (1-12 cr. each semester until course credits for didactic, research and minor equals 90 credits; credit for research directly related to the Ph.D. dissertation)
 - DENT-R 958 ORAL BIOLOGY RESEARCH
 - DENT-G 930 PREVENTATIVE DENTISTRY RESEARCH
 - DENT-G 921 DENTAL MATERIALS RESEARCH
 - G901 Advanced Research: Once 90 total credits have been accumulated in the appropriate areas, students may enroll once each semester for a maximum of 6 semesters until completion of the dissertation.
 - **Minor Courses:** The minor consists of 12 credit hours in any one of the advanced basic science courses (anatomy, biochemistry, biomedical engineering, chemistry, materials science engineering, mechanical engineering, microbiology and immunology, pathology, pharmacology, physiology, life science, health informatics, public health, biostatistics, medical neuroscience, clinical research, biomedical and life science teaching and learning or their equivalents). The selection of the minor will be approved by the student's

advisory committee and the chairperson of the minor department. Credit hours for the required courses may not count toward the minor courses.

- **Major/track Courses**

- **Oral Biology Track**

- Required Courses
 - Biochemistry (Choose 1; minimum 3 credits)
 - BIOC-B 500 INTRODUCTORY BIOCHEMISTRY
 - BIOC-B 800 MEDICAL BIOCHEMISTRY
 - GRDM-G 817 MOLECULAR BASIS OF CELL STRUCTURE FUNCTION
 - DENT-G 905 Bone Physiology, Imaging and Implant Anchorage
 - GRDM-G 865 FUNDAMENTAL MOLECULAR BIOLOGY
 - Microbiology/Immunology (Choose 1; minimum 3 credits)
 - MICR-J 822 GENERAL AND MEDICAL MICROBIOLOGY
 - MICR-J 510 INFECTIOUS MICROBES AND HOST INTERACTIONS
 - MICR-J 805 MOLECULAR IMMUNOLOGY

- **Preventative Dentistry Track**

- Required Courses
 - DENT-R 909 ADVANCED PREVENTIVE DENTISTRY I
 - DENT-R 910 ADVANCED PREVENTIVE DENTISTRY II
 - DENT-R 911 ADVANCED PREVENTIVE DENTISTRY III
 - DENT-G 959 GRADUATE ORAL MICROBIOLOGY

- Additional courses can be selected for the major subject
 - DENT-G G911 DENTAL MATERIALS SCIENCE AND ENGINEERING
 - DENT-G G967 ADVANCED PERIODONTICS
 - Required dental science courses for non-dental Preventative Dentistry track applicants. Applicants without a dental degree may apply for the Preventive Dentistry track but are required to take the following course in the first two years of their program.
 - DENT-G 935 DENTAL PEDIATRICS

- **Dental Materials Track**

- Biochemistry/Microbiology Requirement (Choose 1; minimum 3 credits)
 - BIOC-B 500 INTRODUCTORY BIOCHEMISTRY
 - DENT-G 959 GRADUATE ORAL MICROBIOLOGY
 - Dental Materials Courses
 - DENT-G 911 DENTAL MATERIALS SCIENCE AND ENGINEERING
 - DENT-G 912 PROPERTIES AND TEST METHODS: DENTAL MATERIALS
 - DENT-G 913 CLINICAL APPLICATIONS OF DENTAL MATERIALS

Qualifying Examination (for Admission to Candidacy)

The qualifying exam consists of two parts: 1) writing and presenting an oral defense of a research proposal, and 2) sitting for a comprehensive written examination.

- **Research Proposal and Oral Defense:**

The student chooses, usually by the end of the second Spring semester following enrollment, with help from and approval of the Advisory Committee Chair, a topic for a grant proposal to be written and defended as part of the qualifying exam. The topic may be in the area of the student's intended dissertation research but cannot be written by anyone other than the student or prepared as a requirement of another course.

Students should begin with an outline for a proposal that is approved by the Committee Chair. After approval, the student writes a proposal in the style of an NIH R01 grant proposal including the following sections: Summary, Specific Aims, Background and Significance, Research Design and Methods, Literature Cited and Budget, but with the length reduced to a maximum of 15 single-spaced, 12-point font pages for the following sections: Summary, Specific Aims, Background and Significance, and Experimental Design. There are no page limits for the Literature Cited and Budget sections. The proposal, once written to the satisfaction of the student, is submitted to the Committee Chair, who distributes copies to the rest of the Committee. The Committee may decide that the proposal is defensible, or it may require revisions prior to a defense. Upon final approval, a time is set for defense of the proposal by the student in the presence of the Committee.

The defense of the proposal consists of a 30-45 minute presentation of the proposed work by the student, followed by a 1-3 hour oral examination consisting of questions arising from the proposal, the student's presentation or answers to initial questions. Satisfactory defense of the proposal will be followed, at a date and time (within 60 days after the proposal defense) convenient to the members of the committee and student, by a written exam. Students who do not satisfactorily complete the defense of the proposal may be allowed to retake the proposal defense with the permission of the advisory committee.

- **Written Exam:**

Each member of the Advisory Committee will submit a comprehensive question or a series of questions in his/her area(s) of expertise to the Chair of the Committee. The Chair will then consolidate the questions from all five committee members, and the exam package will be handed to the student on the morning of the exam. The student will be provided with a room in which to complete the examination (without notes or any other study aids). It is expected that the exam will be typed and completed within 8 hours. The entire exam is returned to the Chair, who distributes the answers to individual committee members for correction within a week. Students who do not satisfactorily complete the written exam may be allowed to retake the exam once with the permission of the advisory committee. In addition, students who fail both components of the qualifying exam are normally allowed to retake the exam once. The qualifying exam must be completed at least eight months before the degree is awarded.

Nomination to Candidacy for the Ph.D. Degree

Following the passing of the qualifying examination and the completion of all course work and departmental language or research-skill requirements (if any), the student will Graduate School policies for nomination and post-candidacy timelines.

Research Committee:

The student's research committee must be formed and approved by the end of the second year of the program. The student will complete and submit the Research Committee Nomination Form. Members of the student's Advisory Committee may continue to serve as

members of the Research Committee while adhering to Graduate School policy. The research committee is responsible for supervision of the student's research, reading and providing scientific and editorial comments on the dissertation, and conducting the final examination (defense of dissertation). The research committee, except for the outside member, shall meet formally with the student at least twice annually, to assess progress and make appropriate suggestions. During one of these assessments, most likely during the 3rd or 4th year, the student will present an open school-wide 45-50 minute presentation at least 6 months prior to finishing the dissertation. The defense of the dissertation will consist of an open University-wide 45-50 minute presentation followed by a 1-3 hour oral examination by only the research committee consisting of questions from the dissertation.

Dissertation

When the dissertation has been completed, the student should submit an unbound copy to each member of the research committee as the initial step in scheduling the defense of the dissertation. All members of the research committee should read the dissertation in its entirety before attending the defense. At this stage, both the student and the faculty members must extend certain courtesies to each other. It is the responsibility of the student to give faculty members sufficient time to read the dissertation without making unreasonable requests of them based upon the IU Graduate School time limitations, immediate job possibilities, contract renewal, or other reasons. Similarly, a faculty member should not keep a student's work for an excessive period of time because of the press of other duties.

If the committee members have read the dissertation, there should be direct communication (either in writing or orally) between the research committee chairperson and the other committee members about the readiness for defense. Readiness for defense, however, is not tantamount to acceptance of the dissertation; it means that the committee is ready to make a decision. The decision to hold a doctoral defense, moreover, is not entirely up to the research committee. If a student insists upon the right to a defense before the committee believes the dissertation is ready, that student does have the right to due process, but exercises it at some risk.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

DENT-D 505 FUNDAMENTALS OF ETHICS AND PROFESSIONALISM (0.5-3 cr)- In this course you will learn about the principles of Ethics and Professionalism. You will be introduced to ethical principles and values related to dental school and dentistry, professional responsibilities, and ethical standards involved in the doctor-patient relationship.

DENT-G 905 BONE PHYSIOLOGY, IMAGING AND IMPLANT ANCHORAGE (1-3 cr)- Osteology and clinical imaging of the head and neck is coordinated to types of bone and the physiological principles of skeletal

biomechanics and calcium metabolism; periodontal, TMJ and sutural adaptation to growth, orthodontic/orthopedic loads, and prosthetics is emphasized; implant anchorage for management of partially edentulous malocclusions.

DENT-R 909 ADVANCED PREVENTIVE DENTISTRY I (2-3 cr)

- Basic concepts, principles and techniques relative to the etiology and prevention of oral disease. Analysis of the components of the oral environment, attacking agents, defense mechanisms and preventive measures.

DENT-R 910 ADVANCED PREVENTIVE DENTISTRY II (2-3 cr)

- Basic concepts, principles and techniques relative to the etiology and prevention of oral diseases. Analysis of the components of the oral environment, attacking agents, defense mechanisms and preventive measures.

DENT-R 911 ADVANCED PREVENTIVE DENTISTRY III (3 cr)

- Basic concepts, principles and techniques relative to the etiology and prevention of oral diseases. Analysis of the components of the oral environment, attacking agents, defense mechanisms and preventive measures.

DENT-R 956 CURRENT TOPICS IN ORAL BIOLOGY (4 cr)

- Purpose is to familiarize students with current areas of research in Oral Biology through a combination of lectures and literature discussions on topics covered in review articles and original research papers appearing in journals devoted to various aspects of Oral Biology.

DENT-R 957 INTRODUCTION TO RESEARCH IN ORAL BIOLOGY (3 cr)

- Laboratory research instruction in oral biology. Purpose is to introduce students to different research programs in the field of Oral biology.

DENT-R 958 ORAL BIOLOGY RESEARCH (1-12 cr)

- Data obtained in this course may be used to meet the dissertation requirements for the Ph.D.

DENT-G 910 PREVENTATIVE DENTISTRY (1-2 cr)

DENT-G 910 DENTAL MATERIALS (1-2 cr)

DENT-G 911 DENTAL MATERIALS SCIENCE AND ENGINEERING (1-3 cr)- Composition, chemical reactions and physical properties, clinical significance of metals, resins and other materials used in dentistry; phases of metallography, physical chemistry and physics pertinent to the field. Laboratory experience in specimen preparation, use of the metallograph and SEM.

DENT-G 912 PROPERTIES AND TEST METHODS: DENTAL MATERIALS (1-3 cr)

- Discussion of the basic physical, mechanical and chemical properties with emphasis on the relationship to dental materials. Methods applicable to testing dental materials for these properties will be discussed along with ADA and ANSI specifications. (Laboratory demonstrations of instruments.)

DENT-G 913 CLINICAL APPLICATIONS OF DENTAL MATERIALS (1-3 cr)

- This is a seminar course in which the clinical behavior and manipulation of dental materials as related to basic physical and chemical properties of the materials are discussed. Specific clinical problems are defined and knowledge of basic properties applied to explain the behavior and/or solve the problem.

DENT-G 921 DENTAL MATERIALS RESEARCH (1-12 cr)

DENT-G 930 PREVENTATIVE DENTISTRY RESEARCH (1-12 cr)

- This non-lecture course consists of regular one-on-one contact between the student and instructor(s) to actively help the student complete a research thesis/protocol in a timely manner. It includes the following phases: pre-planning research, study design, planning, execution, evaluation and final write-up. Use of support facilities and research equipment is covered.

DENT-G 959 GRADUATE ORAL MICROBIOLOGY (3 cr)

- Role of oral microorganisms in health and disease states of the host. Emphasis is placed on the biological mechanisms involved in dental caries, periodontal disease and specific microbial infections of the oral cavity.

DENT-G 967 ADVANCED PERIODONTICS (1-4 cr)

- Review of oral medicine including internal medicine, pharmacology, pathology and the treatment of oral lesions.

DENT-G 935 DENTAL PEDIATRICS (1-2 cr)

- Medical and dental problems of the chronically ill or handicapped child; lectures, discussions, and ward rounds cover physical diagnosis, normal and abnormal physical and emotional growth of the child.

BIOC-B 500 INTRODUCTORY BIOCHEMISTRY (3 cr)

- Structures of carbohydrates, proteins, lipids and nucleic acids. Basic principles of enzyme catalysis, protein synthesis, intermediary metabolism and nutrition.

BIOC-B 800 MEDICAL BIOCHEMISTRY (3 cr)

- Biochemistry for medical students. Structure and function of biological molecules, regulation of cellular processes by nutrients and hormones, biochemical and molecular basis of disease. Designed to develop the knowledge base for Competency III "Using Science to Guide Diagnosis, Management, Therapeutics and Prevention".

GRDM-G 504 INTRODUCTION TO RESEARCH ETHICS (1-3 cr)

- Introduction to the basic concepts of research ethics. The course will cover the historical development of concern with ethics in science as well as practical information needed by students working in science today. Format will be lecture and discussion.

GRDM-G 505 THE RESPONSIBLE CONDUCT OF RESEARCH (1 cr)

- An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 655 RESEARCH COMMUNICATIONS SEMINAR (1-2 cr)

- Study of the methodological and systematic treatments of scientific data required for effective communication through written primary and secondary research publications, oral presentations, abstracts, post presentations, and grant proposals.

GRDM-G 817 MOLECULAR BASIS OF CELL STRUCTURE FUNCTION (2 cr)

- Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 865 FUNDAMENTAL MOLECULAR BIOLOGY (3 cr)

- Principles of molecular biology, emphasizing the

structure, replication, repair and recombination of the genetic material and the molecular mechanisms of gene expression. Both prokaryotic and eukaryotic systems are covered. (Joint program with Medical and Molecular Genetics and Microbiology and Immunology).

MICR-J 510 INFECTIOUS MICROBES AND HOST INTERACTIONS (3 cr)- Emphasis on the molecular and cellular events which permit pathogenic bacteria and viruses to enter human cells and disrupt cell function while evading the host's immune system.

MICR-J 805 MOLECULAR IMMUNOLOGY (3 cr)- Characterization of immunologically relevant molecules in terms of molecular genetics, synthesis and assembly, structure-function and evolutionary relationships, and functional roles in immune responses. Entities to be considered include members of the immunoglobulin superfamily and functionally associated molecules.

MICR-J 822 GENERAL AND MEDICAL MICROBIOLOGY (3 cr)- Lectures covering the biology of various pathogenic organisms such as bacteria, viruses, fungi, and parasites, their role in human disease with emphasis on determinants of microbial virulence, the mechanisms of host responses to infection, and the role of these factors in the pathogenesis of disease.

EDUC-J 500 INSTRUCTION IN THE CONTEXT OF CURRICULUM (3 cr)- First course for the Master's degree in Curriculum & Instruction. Extends concepts introduced in undergraduate teacher preparation. Topics include conceptions and definitions of curriculum and instruction and their impact on social contexts, learning theories, and schooling practices. Elementary and secondary contexts are studied.

ENG-W 531 DESIGNING AND EDITING VISUAL TECHNICAL COMMUNICATION (4 cr)- This course explores rhetorical theories guiding visual communication within technical publications, both paper and electronic. In addition, students gain experience in cooperatively designing and editing visually-oriented publications for specific audiences and purposes.

PBHL-P 551 BIOSTATISTICS FOR PUBLIC HEALTH I (3 cr)- This course introduces the principles and methods of data analysis using R studio in public health biostatistics. Emphasizing public health examples as they relate to concepts like sampling, study design, descriptive statistics, probability, statistical distributions, estimation, hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation.

PBHL-B 561 INTRODUCTION TO BIOSTATISTICS I (3 cr)- This course introduces the basic principles and methods of data analysis in public health biostatistics. Emphasis is placed on public health concepts such as sampling, study design, descriptive statistics, probability, statistical distributions, estimation, hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation. SAS software is required.

PSY-I 608 MEASUREMENT THEORY AND THE INTERPRETATION OF DATA (3 cr)- The theory of measurement and the development of reliability and the Spearman-Brown equations, true scores and variables, and correction for attenuation. Variance or covariance of combinations of variables. Item analysis

and test construction strategies. Reliability and validity of measurements and the influence of measurement error and measurement threats to research design.

Earth Sciences

School of Science

Departmental E-mail: geology@iu.edu@

Departmental URL: science.indianapolis.iu.edu/earthsciences

(Please note that when conferring University Graduate School degrees, minors, certificates, and sub-plans, The University Graduate School's staff use those requirements contained only in *The University Graduate School Bulletin*.)

Curriculum

Curriculum

Faculty

Degree Offered

Master of Science in Geology (with concentration in environmental geology), Doctor of Philosophy in Applied Earth Sciences

Doctor of Philosophy

Special Departmental Requirements

(See also general University Graduate School requirements.)

The objective of the Ph.D. in Applied Earth Sciences is to provide training at the interface between earth sciences, including water, land, soil, and human welfare. This research degree focuses on the beneficial and harmful interactions between humans and earth systems and is interdisciplinary in scope and training. The PhD program is organized into four concentration areas (or cores): physical earth, geochemical processes, water resources, and human and environmental systems. Graduates of this program are ideal candidates for academic teaching and/or research, as well as for research positions and science policy positions in government institutions and industry.

Admission Requirements

Prospective students should have a bachelor's or master's degree in the physical, biological, or medical sciences, and a minimum of a B (3.0) average in science courses. One year of chemistry and mathematics through college algebra and trigonometry are required. The Graduate Record Examination (GRE) General Test is not required. Each student must submit three letters of recommendation.

Program Requirements

The degree requires 90 credit hours; we accept up to 30 credit hours of previous graduate course work to satisfy the 90 credit hour requirement. Students will have several required courses, determined by their advisory committee and their research committee, to satisfy the Ph.D. requirements including the concentration area (15 credits), and the minor (12 credits). Within a chosen concentration area, students must take at least 9 credits in the Department of Earth Sciences.

Admitted students are assigned a three-person advisory committee at the beginning of the first year of graduate study. The committee prescribes a study program based on the interests of the student and the principal graduate advisor. By the end of the second semester, the advisory committee appoints a research committee (5 members) to oversee the qualifying exam and the dissertation defense. The research committee includes at least three faculty members from the department of Earth Sciences and the minor advisor (who must be outside the department of Earth Sciences). In order to maintain proper balance in the expertise represented in the research committee, the principal graduate advisor can petition the Graduate Affairs committee to replace one Earth Sciences faculty by an external member, as long as this member has already been approved by the University Graduate School. Upon advancement to candidacy, students must complete all remaining degree requirements within five years.

Common Core

Because of the interdisciplinary nature of the program and the diverse academic background of admitted students, all students are required to take the common core class, "1st Year Graduate Student Seminar." The advisory committee may recommend one more fundamental earth sciences course to address deficiencies.

Minor

The minor consists of 12 credit hours of advanced coursework completed either outside of the Department of Earth Sciences (ES), or within an Indiana University (IU) approved minor program, as approved by the student's advisory committee and the chairperson of the department hosting the minor. If the IU minor also includes courses within the ES Department, such courses cannot also count toward the required 15 credits for the concentration area (see above).

Qualifying Examination (for Admission to Candidacy)

The qualifying exam consists of writing and presenting an oral defense of a research proposal. Successful completion of the qualifying exam is one of the requirements for advancement to degree candidacy.

Grades

A "B" (3.0) average or higher must be maintained; no more than 6 credit hours of "C" are acceptable.

Master of Science in Geology, with concentration in environmental geology

Special Departmental Requirements

(See also general University Graduate School requirements.)

Admission Requirements

Prospective students should have a bachelor's degree in geology, including a summer field course, and a minimum of a "B" (3.0) average in geology courses. One year of chemistry and mathematics through college algebra and trigonometry are required. Individuals with a bachelor's degree in another area of science are also encouraged to apply; the departmental graduate advisory committee will prescribe a plan of study to remove deficiencies. The Graduate Record Examination (GRE) General Test is

not required. Each student must submit three letters of recommendation.

Course Requirements

Both thesis and non-thesis options are available. Both options require at least 21 credit hours of non-research course work, with at least 3 credit hours in courses approved for graduate credit from allied disciplines with the approval of the graduate advisor. Up to 6 credit hours of 400-level courses approved for graduate credit may be counted toward the degree with the approval of the graduate advisor. The thesis option requires the completion of 30 credit hours, 6 of which are taken as G810 Research (the thesis). The non-thesis option requires the completion of 36 credit hours, 3 of which consist of a research project taken as G700 Geologic Problems. The departmental graduate committee must approve elective credits outside the Department of Earth Sciences for both options.

Admitted students are assigned a three-person advisory committee at the beginning of the first year of graduate study. The committee prescribes a study program based on the interests of the student and the principal graduate advisor. Students must complete all degree requirements within five years of beginning this study program.

Grades

A "B" (3.0) average or higher must be maintained; and no grade below "C" is acceptable.

Courses

Course Descriptions

CHEM-I 611 METHODS SCIENCE EDUC RESEARCH:

The course will explore the various research methods in science education research. Qualitative, quantitative, and mixed methods research designs will be introduced. Students will apply the knowledge obtained to design a study, collect, and analyze data using one of these methodologies.

GEOG-G 535 ENVIRONMENTAL REMOTE SENSING:

Principles of remote sensing of the earth and its atmosphere, emphasizing satellite data in visible, infrared, and microwave portions of the electromagnetic spectrum. Emphasis on practical applications and digital image analysis. A satellite data analysis project is required.

GEOG-G 536 ADV REMTE SENSNG:DIG IMAGE PRO:

Advanced remote sensing theory and digital image processing techniques with an emphasis on environmental science applications. Hands-on computer exercises provide significant experience in digital image processing techniques for extraction of qualitative and quantitative information about Earth's terrestrial and aquatic environments.

GEOG-G 537 CMPTR CARTOGRAPHY & GRAPHICS:

GEOG-G 538 GEOGRAPHIC INFORMATION SYSTEMS:

Overview of the principles and practices of Geographic Information Systems (GIS). Spatial data models, database design, introductory and intermediate GIS operations, and

case studies of real-world GIS applications. Laboratory exercises will provide significant hands-on experience. Lecture and laboratory.

GEOG-G 539 ADV GEOGRAPHIC INFO SYSTEMS:

Intermediate and advanced topics in geographic information science and spatial analysis techniques using GIS software. This advanced course is for graduates who seek a greater understanding of this rapidly developing field and to learn how to construct, manage and analyze their own GIS data and models.

GEOG-G 602 TOP SEM CLIMATE, LAND,&ENV CHG:

Topics will vary to consider aspects of climate, land and environmental change.

GEOG-G 639 GIS & ENVIRON ANALYSIS:

Applications of Geographic Information Science principles in the collection, analysis and visualization of spatial data. Integration of GIS, remote sensing, and GPS technologies with web-based GIS applications. Review of current literature on techniques, theory, technology, and applications. Discussion, laboratory, and research project.

GEOL-G 511 STRATIGRAPHY OF NORTH AMERICA:

GEOL-G 519 PRINCIPLES OF GEOMORPHOLOGY:

Course explores the link between geomorphic processes, landforms and deposits. Topics include fluvial, colluvial, Aeolian, glacial, slope, weathering, tectonic and karst processes. Lab component includes a mixture of in-class and field assignments. A final fieldtrip will be conducted toward the end of the semester as a capstone experience.

GEOL-G 525 GLACIAL GEOLOGY:

Formation, dynamics, and regimen of glaciers. Erosional and depositional processes and landforms. Glaciation of North America with emphasis on stratigraphy, soils, climates, and physical changes resulting from glacial processes and environments. Three one-day field investigations and a student research project are required.

GEOL-G 527 GEOLOGICAL OCEANOGRAPHY:

Geological features and processes operating in the oceans; continental shelf, slope and ocean-basin geomorphology, sedimentology, structure, and composition; origin and geologic history of seawater and ocean basins; tools applied to marine geological studies.

GEOL-G 535 QUATERNARY GEOLOGY:

Characteristics, distribution, and origin of Pleistocene and Recent deposits; stratigraphy and chronology; formation of associated landforms, landscapes, paleosols, and soils; Quaternary environments.

GEOL-G 536 EARTH OBSERVATION FROM SPACE:

Introduction to the physical principles and strategies underlying the spectroscopic analysis of remotely-sensed data. Topics include spectral characteristics of geologic materials at visible, near-infrared and shortwave infrared wavelengths, imaging spectroscopy, examples of applying hyperspectral remote sensing data for geologic mapping. Lab assignments on reflectance spectroscopy and image processing are included.

GEOL-G 545 APPL ANALYTICAL TECH IN GEOL:

Principles of advanced analytical techniques including x-ray analysis, electron beam imaging and analysis, and mass spectrometry, with applications in geosciences. Lectures on theory followed by laboratory exercises. Student will complete individual or collaborative research projects.

GEOL-G 546 PLANETARY REMOTE SENSING:

Application of multi-spectral data for exploration and mapping of planetary surfaces.

GEOL-G 547 PLANETARY GEOLOGY:

The course Planetary Geology is designed to introduce geological features and processes on planets and discuss how these geological processes shaped planets and governed the evolution of planets.

GEOL-G 550 SURFACE WATER HYDROLOGY:

Mechanics of surface runoff and open channel flow. Rainfall-runoff equations, probability analysis of streamflow, and watershed simulation models. Chemistry of surface waters and stream pollution.

GEOL-G 551 ADVANCED HYDROLOGY:

Basic principles and quantitative aspects of physical flow systems and chemistry of groundwater and surface water. The relationships between water and geologic materials.

GEOL-G 557 PALEOCLIMATOLOGY:

An understanding of Earth's climate history and the forces that drive climatic change. Students will learn about the fundamentals of the global climate system, how and why Earth's climate has changed through time, and the tools and methods that paleoclimatologists use to reconstruct past climates and environmental change.

GEOL-G 561 PALEOECOLOGY:

Relationships between modern and fossil organisms and their physical, chemical, and biological environments; emphasis on techniques for interpreting past environmental conditions.

GEOL-G 567 GEOHEALTH:

When our Health Collides with our Environment is the study of the interrelationship between earth processes and human health. The spatial distribution and specific processes that can change exposure to certain materials can affect human health; this class will take a detailed look at these scientific issues.

GEOL-G 583 ISOTOPE GEOCHEMISTRY:

GEOL-G 585 ENVIRONMENTAL GEOCHEMISTRY:

Aquatic and environmental geochemistry, including freshwater and marine systems, natural and human-induced changes to geochemical systems, and the geochemical record of paleoceanographic and paleoclimatic variations.

GEOL-G 587 HYPERSPECT REMT SENS GLOBL CHG:

This course is designed to introduce senior undergraduates and graduate students to the methods and strategies underlying the application of hyperspectral

remote sensing in solving environmental problems. The class includes lab assignments on spectroscopy and image processing.

GEOL-G 595 DATA ANALYS TECH IN GEOSCIENCE:

Application of statistical and numerical analysis techniques to geoscience data, including confidence intervals, least squares methods, correlation, time series analysis, and cluster analysis. Emphasis on using a computer to solve geoscience problems.

GEOL-G 610 LRNING THEORIES SCI EDUC RSRCH:

Students are introduced to the learning theories and frameworks that inform discipline-based education research and the methods therein. Students will consider how cognitive science, philosophy of science, and sociological/cultural perspectives influence and contribute to learning in science and science education research.

GEOL-G 621 MODELING HYDROLOGICAL SYSTEMS:

Introduction to ground water flow and solute transport modeling. Includes development of equations describing ground water flow and applied groundwater/contaminant transport modeling using a variety of current software packages.

GEOL-G 635 SOIL GEOMORPHOLOGY:

Application of geomorphic principles in evaluation of weathering and soil formation; systems analysis of soil-landscape models; present and past environments; paleogeomorphology and paleopedology; lecture, discussion, field and laboratory problems.

GEOL-G 640 FLUVIAL GEOMORPHOLOGY:

Survey of fluvial processes including sediment transport, bed and bank erosion, and river metamorphosis. Examination of the controls on channel form. Analysis of landform genesis with an emphasis on feature sedimentology and stratigraphy. Application of fluvial geomorphic principles of land management and restoration of riparian ecosystems.

GEOL-G 645 CARBONATE SEDIMENTOLOGY:

Course focuses on origin and generation of carbonate grains, description of modern carbonate depositional environments, interpretation of ancient limestone and dolomite sequences, and carbonate diagenesis.

GEOL-G 677 CLIMATE CHANGE AND SOCIETY:

This course will introduce observations, physical mechanisms and consequences of climate change. Particularly, we will discuss the impacts of climate change on the nexus of food, energy and water systems.

GEOL-G 686 ADV SOIL BIOGEOCHEMISTRY:

This course examines the chemical, biological and physical factors controlling the weathering of minerals and the formation of soils. Topics covered include: biological and chemical properties of soils, soil classification, carbon, nitrogen and phosphorus cycling in relation to food production and environmental quality.

GEOL-G 688 GLOBAL CYCLES:

This course will explore the major elemental cycles of the atmosphere, land, lakes, biota, and oceans, as well as the human impacts on these cycles. This course will take a global approach to geochemistry and environmental problems and will introduce fundamental concepts of meteorology, surficial geology, biogeochemistry, limnology,

and oceanography.

GEOL-G 690 ADVANCED GEOLOGY SEMINAR:

GEOL-G 700 GEOLOGIC PROBLEMS:

Consideration of special geological problems.

GEOL-G 810 RESEARCH:

Urban Education Studies

School of Education

Departmental URL: education.indianapolis.iu.edu/academics/degrees-programs/doctoral/urban-education/

Curriculum

Curriculum

Degree Offered

Doctor of Philosophy in Urban Education Studies and Dual Doctor of and Master of Legal Studies, PhD Minor in School Counseling, PhD Minor in Education Law, Policy & Advocacy, PhD Minor in Educational Leadership, PhD Minor in Mathematics Education

Program Description

Our society, schools, and communities need educational leaders, scholars, and activists who have an in-depth understanding of the complex assets and challenges within the urban education environment.

This need is for those who can respectfully value the many strengths of historically marginalized communities and who can courageously address and overcome disparities related to race, class, gender, sexuality, disability, religion, cultural background, and language barriers. Accordingly, the Urban Education Studies (UES) doctoral program provides students with the critical foundational understanding to serve this need.

To accomplish this, the UES doctoral program, using a cohort model, focuses on a deep study of urban education and of the complex assets and challenges of historically marginalized communities within the urban context. The faculty use collaborative discussions; practice thinking critically; various writing and presenting exercises; in-depth study of articles, books, research methodologies, and research theories; address of educational activism; among other activities and approaches. The intended result is the development of activist-scholars.

Further, this program is nationally unique in two ways: 1) the students in each cohort average over 60% being students of color, and 2) over 60% of the faculty are scholars of color. This provides an exciting, creative, varying learning environment, very different from almost all other doctoral programs in the US.

Graduates of the UES doctoral program have become school leaders, university professors, leaders in research and intervention centers, higher education leaders,

and leaders in non-profit organizations, among other possibilities.

Students in this program develop a keen understanding of the many assets in the urban environment and the challenges urban schools and communities face, including:

- Responding to ethnic, racial, linguistic, income, sexual orientation, disability, and cultural assets and inequities within formal and informal education settings and the urban context
- Understanding the nature of schooling and the communities they serve
- Interrogating the complex educational policy and political environment in which urban schools exist

Doctor of Philosophy in Urban Education Studies

Admissions Requirements

Admission to the Urban Education studies doctoral program is competitive and requires faculty approval. Admission is based on an applicant's qualifications, submitted application materials (including official transcripts*, resume/curriculum vitae, writing sample, personal statements, letters of recommendation), a personal interview, and references. The GRE is not required for admission. In addition, the IU School of Education Indianapolis follows standard policies and procedures of the IU Indianapolis Graduate School.

A master's degree is required for admission to the program. If you are enrolled in a master's program at the time you apply but have not yet completed the program, you must do so before you begin urban education studies doctoral course work.

There are several items you need to submit along with your application to the Urban Education Studies doctoral program.

1. CV/Resume Submit an updated cv/resume that lists your education and professional experiences. Select the "CV/Resume" tab to upload your cv/resume.
2. Statement of Experience Submit a 500–1,000 word statement of your experience in urban environments and with urban community service. If you do not have experience in urban settings, then explain why an urban-oriented doctoral program would be a good fit for you. The statement should demonstrate the quality of your writing. Select the "Other" tab to upload your experience. Include in your document title, Statement of Experience. Please use one of the following file formats: doc, .docx, or .pdf.
3. Statement of Values Submit a 500–1,000 word statement about your core personal values, particularly in relation to education. The statement should demonstrate the quality of your writing. Select the "Other" tab to upload your values. Include in your document title, Statement of Values. Please use one of the following file formats: doc, .docx, or .pdf.
4. Personal Statement Submit a 500–1,000 word personal statement that summarizes your immediate and long-term professional goals as they relate to your intent to pursue a doctorate in urban education studies. The statement should demonstrate the quality of your writing. Select the "Personal

Statement" tab to upload your statement. Include in your document title, Personal Statement. Please use one of the following file formats: doc, .docx, or .pdf.

5. Writing Sample Submit one writing sample (e.g., a published paper, technical report, final paper from a graduate course, etc.). Writing samples will be assessed on both quality and student fit. Consider submitting a sample that speaks to your research interests in urban education and showcases your best writing skills.

Program Requirements

90 credit hours of coursework including:

Urban Education Studies Major (36 credit hours)

- Required courses (21 credit hours)
 - EDUC-T 620 Issues in Urban Education (3)
 - EDUC-T 650 Teaching Internship in Urban Education (3)
 - EDUC-T 670 Urban Educational Change: Advocacy and Action (3)
 - EDUC-T 750 Topical Seminar in Urban Education (6-taken twice for 3 credit hours each)
 - EDUC-T 701 Introduction to Critical Race Theory (3)
 - EDUC T-702 Urban Education Studies Proseminar (3)
 - EDUC-T 706 Gender Diversity in Schools and Curriculum (3)
- Additional Major Area Electives (15 credit hours)
 - EDUC-A 560 Political Perspectives of Education (3)
 - EDUC-A 653 The Organizational Context of Education (3)
 - EDUC-A 672 Moral Dimensions of Leadership (3)
 - EDUC-H 520 Education and Social Issues (3)
 - EDUC-H 530 Philosophy of Education (3)
 - EDUC-J 500 Instruction in the Context of Curriculum (3)
 - EDUC-J 630 Curriculum Theory and Practice (3)
 - EDUC-K 553 Classroom Management and Behavior Support (3)
 - EDUC-K 548 Families, School and Society (3)
 - EDUC-L 500 Instructional Issues in Literacy, Culture, and Language Education (3)
 - EDUC-L 524 Language Education Issues in Bilingual and Multicultural Education (3)
 - EDUC-L 540 ESL/EFL Instruction and Assessment Approaches (3)
 - EDUC-P 507 Assessment in Schools (3)
- Inquiry core (15 credit hours)
 - EDUC-Y 521 Methodological Approaches to Educational Inquiry (3) OR EDUC-Y 520 Strategies for Educational Inquiry (3)
 - EDUC-Y 502 Intermediate Statistics Applied to Education (3)
 - EDUC-Y 611 Qualitative Inquiry in Education (3)

- EDUC-Y 650 Topics in Educational Inquiry Methodology (3)
- Topic: Multivariate Statistics in Education Research
- EDUC-Y 711 Advanced Critical Qualitative Inquiry
- **Minor (12 to 18 credit hours):** In consultation with and approval of your Advisory Committee, you will identify a Minor area of study. The Minor either can be individualized, meaning the student and their chair, developed a thematic Minor or can be a formal Minor, meaning the student has to take a set of required courses. Course credit hours taken to satisfy PhD Minor requirements may vary depending on the Department/School through which the Minor is completed.
- **Electives or Second Minor (6 - 12 credit hours):** In consultation with and approval of your Advisory Committee, you will take Elective courses that give you additional breadth of knowledge around your particular interests and contribute to a coherent plan of study.
 - Together, the Minor and Elective courses must total a minimum of 24 credit hours.
- **Dissertation (15 credit hours)**
 - EDUC-T 795 Doctoral Proposal Preparation in Urban Education (3)
 - EDUC- T 798 Dissertation Seminar (3)
 - EDUC- T 799 Doctoral Thesis in Urban Education (at least 9 credits in total)

Advisory Committee

All students in the Urban Education Studies PhD program, with approval of the program coordinator, will select an advisory committee of three faculty members, one of whom represents the student's minor area of study.

Qualifying Examination

All students must complete a qualifying examination focused on comprehensive understanding of program coursework including both a written component and an oral defense.

Research Committee

Upon successful completion of coursework, qualifying dossier, and qualifying examinations, students, with approval of the program coordinator, will select a research committee of four faculty members including one outside member. The research committee must approve the proposed and completed dissertation study.

Final Examination

Oral defense of dissertation.

Dual Doctor of Philosophy in Urban Education Studies and Master of Legal Studies

Program Description

Students who successfully complete this dual degree program will receive a Master of Jurisprudence Degree (MJ) from the Robert H. McKinney School of Law and a Doctor of Philosophy (PhD) degree from the IU Graduate

School and IU School of Education Indianapolis. As stand-alone degrees, the MJ degree is 30 credit hours and the PhD degree is 90 credit hours. The dual MJ/PhD degree is at least 90 credit hours. Both degrees must be conferred simultaneously.

Admissions Requirements for dual MLS/PhD Program

Applicants to the dual MLS PhD degree must apply and be admitted to each program separately and must adhere to the admissions requirements and prerequisite courses stipulated by each program. The student's decision to complete the dual MJ-PhD degree must be declared to the MLS and PhD programs.

PhD students are required to have a master's degree for admissions into the PhD program, and PhD students have the option to transfer 30 credits of their master's degree into their PhD Program of Studies. Dual degree students will have the combination of two options: (1) they may transfer all 24 credits of the MLS into the PhD Program of Studies and have an additional 6 credits to transfer in so long as all credits are of grades no lower than B and complies with Graduate School policies; (2) they may transfer all MLS credits with grades no lower than B and have the option to transfer additional master's credits per Graduate School policies up to a total of 30 credit hours. MLS credits will first satisfy the PhD minor requirements and allow for elective credits to have a potential combination of MLS and other master's credits. Dual degree students will have an individualized PhD minor.

Review the admission requirements for the Urban Education Studies, doctoral program.

Information about the MLS program and admission process is available here: <https://mckinneylaw.iu.edu/admissions/mls/>

For more information contact Sharice Booker
Director of Graduate Programs
IU Indianapolis School of Education
Phone: 317-274-0928
Email: sbreland@iu.edu

Application Deadline

The priority application deadline is August 1st of each year. Here is information about the application requirements: education.indianapolis.iu.edu/admissions-aid/apply/doctoral/

To apply, complete the online application and submit the required documents.

Program specific questions can be directed to the program coordinator, Dr. Crystal Morton at cranhill@iu.edu.

Minors offered by the School of Education PhD Minor in School Counseling

A minor in School Counseling requires 12 credit hours of the following courses or equivalent. Determining equivalency for these courses will need to occur in consultation with a Counseling/Counselor Education faculty member, and transferred courses must come from Council for Accreditation of Counseling & Related Educational Programs (CACREP) accredited programs.

- Required Courses (12 credit hours):
- EDUC-G 522 COUNSELING THEORIES
- EDUC-G 523 LABORATORY IN COUNSELING AND GUIDANCE
- EDUC-G 552 CAREER COUNSELING-THEORY AND PRACTICE
- EDUC-G 575 MULTICULTURAL COUNSELING

PhD Minor in Education Law, Policy & Advocacy

The Educational Law, Policy, & Advocacy PhD minor requires students to complete 12 credit hours. Of the 12 credits, 3 credits are elective and may be fulfilled through the School of Education or other schools (e.g., O'Neill, Social Work, Law) with minor advisor approval. Courses must be at the graduate level and support students' research interests. The combination of coursework focuses on topics related to educational law, leadership, and policy.

- Required courses (9 credit hours)
 - EDUC-A 608 LEGAL AND ETHICAL PERSPECTIVES ON EDUCATION
 - EDUC-A 560 POLITICAL PERSPECTIVES OF EDUCATION
 - EDUC-T 531 ORGANIZATIONAL CHANGE IN CULTURAL AND LINGUISTICAL DIVERSE SCHOOLS
- Elective Courses- Choose 1 (3 credit hours)
 - EDUC-A 615 ADVANCED SCHOOL LAW
 - EDUC-A 653 THE ORGANIZATIONAL CONTEXT OF EDUCATION
 - EDUC-A 672 MORAL DIMENSIONS OF LEADERSHIP
 - SWK-S 505 SOCIAL POLICY ANALYSIS AND PRACTICE
 - SWK-S 618 SOCIAL POLICY AND SERVICES
 - SWK-S 663 COMMUNITY ORGANIZING AND ADVOCACY
 - SPEA-V 510 ADVOCACY AND GOVERNMENT RELATIONS
 - SPEA-V 513 MANAGING CHANGE AND ORGANIZATIONAL DEVELOPMENT
 - SPEA-V 540 LAW AND PUBLIC AFFAIRS
 - SPEA-V 663 POLICY ANALYSIS

PhD Minor in Educational Leadership

The Educational Leadership PhD minor requires students to complete 12 credits of courses within the EDUC-A category at a 500 or 600 level that support student's research interests. A-prefixed courses focus on topics related to K-12 educational administration, leadership and policy. This minor provides students in the Urban Education Studies PhD program, and other PhD programs at IU Indianapolis with a minor option that focuses on research, practice and policy related to educational administration. This minor would be valuable for students (in any school) whose research interest overlaps with issues related to educational organizations, policy, and leadership. It is recommended that the 12 credit hours of coursework be at 600-level or above.

PhD Minor in Mathematics Education (15 credits)

Minor Description

The Mathematics Education Minor requires 15 credit hours of coursework and is designed to help doctoral students learn about research on the learning and teaching of mathematics, and research on the preparation of mathematics teachers. The minor will be personalized, designed by the student and his/her minor advisor.

Minor Requirements

- Required Courses:
 - EDUC-N 716 TOPICAL SEMINAR IN MATHEMATICS EDUCATION (3 credits)
 - Take two times for 6 total credits
 - Choose one of the following:
 - EDUC-N 610 INTERNSHIP IN MATHEMATICS EDUCATION
 - EDUC-N 590 INDEPENDENT STUDY OR RESEARCH IN MATHEMATICS EDUCATION
- Elective Courses
 - EDUC-N 517 ADVANCED STUDY IN THE TEACHING OF SECONDARY SCHOOL MATHEMATICS
 - EDUC-N 518 ADVANCED METHODS IN THE TEACHING OF MIDDLE/JUNIOR HIGH SCHOOL MATHEMATICS
 - EDUC-N 543 ADVANCED STUDY IN THE TEACHING OF MATHEMATICS IN THE ELEMENTARY SCHOOLS
 - EDUC-N 590 INDEPENDENT STUDY OR RESEARCH IN MATHEMATICS EDUCATION
 - EDUC-N 610 INTERNSHIP IN MATHEMATICS EDUCATION
 - EDUC-N 716 TOPICAL SEMINAR IN MATHEMATICS EDUCATION

Courses

Course Descriptions

- **EDUC-T 620 Issues in Urban Education (3 cr)** - Advanced study of contemporary urban educational issues. Explores research and arguments related to current educational issues in American cities. Studies and interrelates research done in the areas of public and private schools, federal, state and local government agencies, community organizations, higher education, and the private sector.
- **EDUC-T 650 Teaching Internship in Urban Education (3 cr)** - Mentored by education faculty, advanced graduate students practice teaching at the university level, in professional development contexts, or some comparable situation that provides opportunities for curriculum development and teaching. The student's professional goals will significantly influence the prescribed experiences.
- **EDUC-T 670 Urban Educational Change: Advocacy and Action (3 cr)**
- **EDUC-T 750 Topical Seminar in Urban Education** (6 credit hours-taken twice for 3 credit hours)

each) This variable topics course focuses on an organized, disciplinary approach to problems in or dimensions of urban education. The course provides an overview of the discipline-based theory and research related to the topic as well as critiques the theory, identifies gaps in the research, and explores potential research projects.

- **EDUC-T 701 Introduction to Critical Race Theory (3 cr)** - This graduate seminar will explore the foundations and central tenets of Critical Race Theory. The course will also examine the sister CRITs and part of an overall analysis of CRT as a framework and a methodology.
- **EDUC T-702 Urban Education Studies Proseminar (3 cr)** - The proseminar will offer sessions on progressing through the UES program, the research process, guidance on academic writing and scholarly presentations. This course will also provide students an opportunity to build their familiarity with professional associations, journals, publication of research in urban education, and School of Education faculty.
- **EDUC-T 706 Gender Diversity in Schools and Curriculum (3 cr)** - This course involves the study of gender, culture, and power and includes research and theory from educational psychology, sociology, history, and current feminist scholarship and its application to resources, programs, and policies in schools and social institutions.
- **EDUC-A 560 Political Perspectives of Education (3 cr)** - This course focuses on theoretical and conceptual approaches useful in describing, explaining, and predicting political behavior related to schools. Forces for continuity and change at local, state, and federal levels are explored.
- **EDUC-A 653 The Organizational Context of Education (3 cr)** - This course examines organizational factors in terms of impact on human behavior and student learning and the critical role of administrative policies and practices in shaping the organizational context. Alternative organizational designs and administrative strategies are studied in terms of their effectiveness under specified conditions.
- **EDUC-A 672 Moral Dimensions of Leadership (3 cr)** - This course examines the concept of leadership from a political, historical, and social framework, with emphasis on values and ethics in the leader-follower relationship. Topics include analyses of change processes, conflict, power, and transformation.
- **EDUC-H 520 Education and Social Issues (3 cr)** - Identification and analysis of major problems set for education by the pluralistic culture of American society.
- **EDUC-H 530 Philosophy of Education (3 cr)** - A study of representative topics in the philosophy of education - indoctrination, the nature of teaching and learning, moral issues in education, etc.
- **EDUC-J 500 Instruction in the Context of Curriculum (3 cr)** - First course for the Master's degree in Curriculum & Instruction. Extends concepts introduced in undergraduate teacher preparation. Topics include conceptions and definitions of curriculum and instruction and their impact on social contexts, learning theories, and

schooling practices. Elementary and secondary contexts are studied.

- **EDUC-J 630 Curriculum Theory and Practice (3 cr)** - Explores fundamental dimensions of curriculum theory, such as: the social construction of knowledge, curriculum as cultural mindset, political reality, and scholarly discourse. Examines varied ideological orientations to curriculum studies. Introduces basic concepts of curriculum design and provides opportunities for curriculum development.
- **EDUC-K 553 Classroom Management and Behavior Support(3 cr)** - Surveys principles of behavior management as they pertain to educational environments. Students will learn how to define, observe, measure, record, and change academic and social behavior.
- **EDUC-K 548 Families, School and Society (3 cr)** - Describes approaches for providing support for families with members with or at risk for disabilities. Focuses on the family as a system, the challenges of parents and siblings, and techniques for parent-professional communication, building collaboration, and increasing family empowerment.
- **EDUC-L 500 Instructional Issues in Literacy, Culture, and Language Education (3 cr)-** This required master's degree course provides an overview of current theory, research, and practice issues related to language, culture, and literacy education. The course takes up current scholarship that explores social, cultural, and political aspects of 21st century language and literacy practices in the classroom, community, and in the culture.
- **EDUC-L 524 Language Education Issues in Bilingual and Multicultural Education (3 cr)** - A survey of language education issues related to the linguistic abilities and educational needs of students requiring bilingual or bidialectal instruction. Topics discussed include language acquisition, language pedagogy, program models, cultural influences, teacher training, and research directions.
- **EDUC-L 540 ESL/EFL Instruction and Assessment Approaches (3 cr)** - The course provides an overview of various approaches to instruction and assessment that incorporate the current thinking in the field. Includes discussion of content-based models of language instruction and standardized, alternative, and authentic forms of assessment.
- **EDUC-P 507 Assessment in Schools (3 cr)** - Introductory assessment course for teachers and school administrators. Topics include principles of assessment, formal and informal classroom assessment instruments and methods, formative and summative assessment, interpretation and use of standardized test results, social and political issues in assessment, use of student data bases in schools.
- **EDUC-Y 521 Methodological Approaches to Educational Inquiry (3 cr)** - Introduction to the various methodological approaches to the conduct of social sciences inquiry in general and educational inquiry in particular. Focus on the epistemological implications of methodological choices.
- **EDUC-Y 502 Intermediate Statistics Applied to Education (3 cr)**

- **EDUC-Y 611 Qualitative Inquiry in Education (3 cr)** - Examination of qualitative approaches to educational inquiry (e.g. case study, naturalistic inquiry, educational anthropology, educational connoisseurship and criticism). Exploration of methods for collecting and analyzing qualitative data, criteria for field studies, and approaches to writing up field studies
- **EDUC-Y 650 Topics in Inquiry Methodology (3 cr)** - Advanced study of research and theory on selected topics in qualitative or quantitative inquiry methodology.
- **EDUC-Y 711 Advanced Critical Qualitative Inquiry (3 cr)** - Advanced qualitative course that builds on students' prior knowledge of social science research paradigms and qualitative methodologies. Draws largely from anthropological and anthropological traditions to explore qualitative research broadly and looks at qualitative analysis as an extension of discussion of theoretical and conceptual frames.
- **EDUC- T 795 Doctoral Proposal Preparation in Urban Education (3 cr)** - This course is for the development of a dissertation proposal in urban education studies. Students must have the consent of a dissertation director or a prospective director to enroll. Students should be finished or nearly finished with program course work.
- **EDUC- T 798 Dissertation Seminar (3 cr)** - This doctoral-level seminar provides structured support for PhD candidates as they progress through the dissertation process. The course emphasizes critical engagement with research design, scholarly writing, and advanced academic discourse. The seminar culminates in a near-complete or defended dissertation draft, positioning candidates for successful completion.
- **EDUC- T 799 Doctoral Thesis in Urban Education (12 cr)** - Credit may be earned over a period of several semesters. Involves individualized study and reflects the ability to conduct research which will solve problems that have both theoretical and practical significance in the field of urban education.

English

School of Liberal Arts

Departmental email: english@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/english

Curriculum

Degrees Offered

Master of Arts in English, Graduate Certificate in Teaching English to Speakers of Other Languages (TESOL), Graduate Certificate in Teaching Literature, Graduate Certificate in Teaching Writing

Master of Arts in English Program Information

IU Indianapolis' graduate English program has been designed to prepare students for careers in the analysis and production of "texts." To this end, the program covers issues and skills in reading and writing, in the richest

sense of these words, to prepare students to address these issues and to teach these skills. Graduates of the program should be prepared for such careers as teaching writing and literature; teaching English as a second language; and writing for business, government, and other professions.

In contrast to traditional M.A. programs, which place heavy emphasis on literary history, the IU Indianapolis program focuses on the application of English studies to contemporary situations and problems. Because of IU Indianapolis' urban, nonresidential setting, its English graduate program will strive, in its curriculum and scheduling, to meet the special needs of part-time, nonresidential students.

Admission Requirements

1. Bachelor's degree and transcripts from all universities and colleges attended, with a minimum grade point average of 3.0 on a 4.0 grading scale in the student's undergraduate major. Applicants are normally expected to have been English majors, but admission will be considered also for those who otherwise demonstrate the competency necessary for successful graduate work in English.
2. Three letters of recommendation
3. A 500-750 word personal statement
4. International applicants must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317- 274-7000.
5. The following deadlines must be observed in order to receive consideration for admission:

January 31 - priority consideration for fall semester

March 1 – summer and regular fall admission

October 15 – spring admission

Course Requirements

Students will take a total of 40 credit hours and must maintain a 3.0 (B) grade point average. A minimum grade of C is required in any course.

Core Courses: At the beginning of the program, students will take core courses that provide an introduction to major areas in the discipline of English. Students must take two of the program's three core courses for a total of 8 credit hours:

- Language: ENG-G 500, Introduction to the English Language (4 cr.)
- Literature: ENG-L 506, Introductory Methods of Criticism/Research (4 cr.)
- Writing: ENG-W 509, Introduction to Writing and Literacy Studies (4 cr.)

Electives: Students will choose eight courses from the program's Plan of Study, and in consultation with a faculty advisor or the graduate director, for a total of 32 credit hours. These 32 credit hours may include a third core course and up to 8 credit hours of Internship.

Graduate Certificate in Teaching English to Speakers of Others Languages (TESOL) Admission Requirements

1. Bachelor's degree and transcripts from all universities and colleges attended, with a minimum grade point average of 3.0 on a 4.0 grading scale in the student's undergraduate major.
2. A personal statement.
3. International applicants must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
4. The following deadlines must be observed in order to receive consideration for admission:

March 1 – summer and regular fall admission

October 15 – spring admission

Course Requirements

The Graduate Certificate in Teaching English to Speakers of Other Languages (TESOL) is a six-course, 19-credit hour program. The five required courses include ENG-Z 500, ENG-Z 520, ENG-Z 523, ENG-Z 541, ENG-Z 545. One Elective option will be selected from ENG-G 625, ENG-Z 652, or LING-T 600. Another English course or a course in another department that is relevant to TESOL is acceptable as an elective with approval from the faculty advisor or graduate director. An emphasis in English for Specific Purposes (ESP) can be earned by taking LING T-600 as the elective course and completing the practicum in an ESP setting.

Graduate Certificate in Teaching Literature

This 20-hour Graduate Certificate in Teaching Literature is a structured program designed for licensed middle school and high school teachers, current M.A. students, and university and college faculty in literature and other subject areas who wish to enhance their professional careers. The certificate offers students an opportunity to explore the theories and best practices that promote learning and strengthen professional mentorship of area teachers.

Admission Requirements

1. Bachelor's degree and transcripts from all universities and colleges attended, with a minimum grade point average of 3.0 on a 4.0 grading scale in the student's undergraduate major.
2. International applicants must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
3. The following deadlines must be observed in order to receive consideration for admission:

March 1 – summer and regular fall admission

October 15 – spring admission

Course Requirements

This certificate requires ENG-L 503, ENG-L 506, and ENG-L 508. Two elective courses will be selected from the program's Plan of Study. These include options in English and Education, and should be chosen by the student in consultation with the faculty advisor or graduate director. Credits earned in the certificate can be applied to an M.A. in English upon acceptance into that degree program.

Graduate Certificate in Teaching Writing

The graduate certificate in Teaching Writing is a 20-hour program of study for certified middle school or high school teachers, part-time university writing faculty and lecturers in other disciplines, and M.A. students interested in earning a certificate in writing to enhance their professional teaching careers. Major topics include theories and methods of teaching writing; understanding linguistic diversity; uses of technology in writing; social aspects of writing development; non-fiction writing; writing assessment; and teacher research.

Admission Requirements

1. Bachelor's degree and transcripts from all universities and colleges attended, with a minimum grade point average of 3.0 on a 4.0 grading scale in the student's undergraduate major.
2. International applicants must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
3. The following deadlines must be observed in order to receive consideration for admission:

March 1 – summer and regular fall admission

October 15 – spring admission

Course Requirements

This certificate requires completion of five graduate courses consisting of one core course (ENG-W 509) and four elective courses, which will be selected by the student, in consultation with the faculty advisor or graduate director, from the program's Plan of Study. Credits earned in the certificate can be applied to an M.A. in English upon acceptance into that degree program.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

English Courses

Linguistics Courses

- **ENG-Z 500 Introduction to the English Language (4 cr.)** An introduction to the English language: its nature, structure, and development.
- **ENG-Z 520 Second Language Development (3 cr.)** Introduction to linguistic, psychological, cognitive, social, and sociocultural approaches to second language development. Explores relationship between second language development and such topics as age, gender, motivation, cognition, and cross-linguistic and sociological influences.
- **ENG-Z 523 TESOL Methods (3 cr.)** This course is designed to help teachers understand, recognize and address the language acquisition challenges of non-native English speakers, both in the U.S. and abroad. The course stresses the development and use of practical techniques and materials to teach ESL based on second-language acquisition principles.
- **ENG-Z 536 Pedagogical Grammar (3 cr.)** The focus of this course is on understanding the

functions that grammar fulfills in oral and written communication, analyzing those aspects of grammar most problematic for English language learners, and exploring approaches to helping learners understand and use those structures in meaningful communicative contexts. The course combines theoretical discussion about various aspects of grammar with consideration of how to prepare effective lessons for teaching grammar to learners of different ages, proficiency levels and needs.

- **ENG-Z 541 English for Specific Purposes and Materials Development (3 cr.)** Students will learn about materials preparation, syllabus design, and test preparation by applying a variety of theories to books and other ESL (English as a Second-language) teaching devices (e.g., tapes, videotapes, software programs) to evaluate their usefulness and will learn to evaluate ESL materials for adequateness.
- **ENG-Z 545 TESOL Practicum (3 cr.)** Students will be placed with a supervising teacher in a class for adult learners of English as a second language. Students will observe and assist the teacher, and then have the opportunity to create, teach and assess lessons.
- **ENG-Z 570 Second Language Writing (3 cr.)** This course explores theories and practices in the teaching and evaluation of second language writing (SLW) as well as connections between first and second language writing, literacy, and culture. Students learn how to identify writing needs, design tasks, and assess writing, and form a philosophy of teaching SLW.
- **ENG-Z 575 Second Language Learning and Technology (3 cr.)** Explores the theory, use, and issues of using technology in second language instruction, focusing specifically on the acquisition of intercultural competence, culture, and pragmatics.
- **ENG-Z 598 TESOL Internship (3 cr.)** The TESOL Internship is designed to provide students with a supervised internship experience in a professional ESL or EFL context. Interns will gain practical, hands-on experience in TESOL, including teaching, research, and/or program administration.
- **ENG-Z 600 Seminar in TESOL (3 cr.)** Topics for this course will vary but will focus on current issues in TESOL and applied linguistics.
- **ENG-Z 652 English Language Sociolinguistics (4 cr.)** A survey course in American and British sociolinguistics, this course investigates the theoretical bases, the major works, and the methodological approaches of current sociolinguistics.
- **ENG-Z 680 Special Topics in Language and Linguistics (4 cr.)** Topics in this course vary within the discipline of linguistics, with the purpose of offering a broader range of topics than are found just within the disciplines of TESOL and Applied Linguistics. Such topics would include semantics, pragmatics, language and mind, conceptual metaphor, critical discourse analysis, and dialectology.
- **ENG-Z 690 Advanced REadings in TESOL (1 – 4 cr.)** Directed reading on a focused topic in TESOL and applied linguistics that students initiate, plan,

and complete under the direction of an English department faculty member. Credit hours depend on scope of project.

- **ENG-G 625 Introduction to Text Linguistics/ Discourse Analysis (4 cr.)** This course introduces students to current approaches to text and discourse coherence, including recent theories of cognitive and interactional text modeling.
- **ENG-G 655 History of the English Language (4 cr.)** A survey of the evolution of the English language from its earliest stages to the present, with reference to its external history and to its phonology, morphology, syntax, and vocabulary.
- **ENG-G 660 Stylistics (4 cr.)** Survey of traditional and linguistic approaches to the study of prose and poetic style. Attention to the verbal characteristics of texts, what they reflect about the author, and how they affect the reader.
- **LING-T 600 Topics in TESOL and Applied Linguistics (3 cr.)** May vary with topic. Intensive study and analysis of selected issues and problems in TESOL and Applied Linguistics. Topics in this course are of particular interest to the second language practitioner.
- **LING-T 690 Advanced Readings in TESOL and Applied Linguistics (1-4 cr.)**

Literature Courses

- **ENG-L 501 Professional Scholarship in Literature (4 cr.)** Applied research methods. Surveys forensic methods of discovering textual variations in successive editions of famous works of literature, framed within a broader survey of literary history and the evolution of Western literary genres. Provides a firm grounding in the terminology of literary research and an understanding of the way that literary scholars work with secondary materials to discover hidden truths (and often to expose mistakes) about texts and authors.
- **ENG-L 503 Teaching of Literature in College (4 cr.)** This course introduces graduate students to the practical and theoretical issues involved in teaching literature including how to set teaching objectives, organize a course and construct a syllabus. Several different approaches to teaching literature, including lecture, discussion, workshop, and online instruction will be explored.
- **ENG-L 506 Introduction to Methods of Criticism/ Research (4 cr.)** The conditions and assumptions of studying English, with emphasis on criticism and research on a culturally and historically diverse range of texts.
- **ENG-L 508 Practicum on Teaching Literature in College (4 cr.)** P: L503 or consent of instructor. Topics include syllabus construction, lecture and discussion techniques, use and evaluation of written work. Offered in two formats: as a practicum in course and syllabus design for a future undergraduate course; or as a practicum for AIs running concurrently with the related undergraduate course.
- **ENG-L 553 Studies in Literature (3 cr.)**
- **ENG-L 590 Internship in English (4 cr.)** A supervised internship in the uses of language in the workplace. Each intern will be assigned a problem or task and will develop the methods for solving or

completing it. Each intern will complete a portfolio of workplace writing and self-evaluation.

- **ENG-L 606 Topics in African American Literature (4 cr.)** Focuses on a particular genre, time period, or theme of African American literature. Examples: twentieth-century African American women's novels, black male identity in literature, kinship in African American literature, African American autobiography. May be repeated twice for credit with different focuses.
- **ENG-L 625 Shakespeare (4 cr.)** Critical analysis of selected tragedies, comedies, history plays, and poetry.
- **ENG-L 641 English Literature 1700-1900 (4 cr.)** This course surveys British literature of the 18th and 19th centuries. Particular emphasis will be placed on major writers and movements and on lesser-known writers who have recently been rediscovered. Categories covered may include: Elizabethan and Jacobean writers, Restoration theater and poetry, the rise of the novel, Neoclassical writers, Romanticism, Victorian writers.
- **ENG-L 643 Readings in Colonial and Postcolonial Literatures (4 cr.)** Study of literature within the historical, cultural and political context of European colonialism and anti- or post-colonial resistance. Topics might include the role of literature in the formation of nations and national consciousness, literatures of particular nations, or postcolonial theory.
- **ENG-L 645 English Fiction, 1800-1900 (4 cr.)** Intensive historical and critical study of nineteenth-century prose fiction, especially the novel.
- **ENG-L 649 British Literature Since 1900 (4 cr.)** This course surveys British literature of the 20th and 21st centuries. Students study important trends and movements within this field, including Realism, Modernism, Surrealism, Postmodernism, and their historical contexts.
- **ENG-L 650 Studies in American Literature to 1900 (4 cr.)** Intensive study of one writer, a group of writers, or a theme or form significant in the period.
- **ENG-L 655 American Literature and Culture 1900-1945 (4 cr.)** Study of American literature and culture from the turn of the century to 1945.
- **ENG-L 657 Readings in Literature and Critical Theory (4 cr.)** Study of major movements, figures, or topics in literary and/or critical theory.
- **ENG-L 666 Survey of Children's Literature (4 cr.)** A survey of literature written for children and adolescents from the medieval period to the present.
- **ENG-L 673 Studies in Women and Literature (4 cr.)** Course may include writers from the 17th through the 21st centuries.
- **ENG-L 680 Special Topics-Literary Study and Theory (4 cr.)** L680 is offered as a Variable Title course. May be repeated for credit with each variable title.
- **ENG-L 681 Genre Studies (4 cr.)** A variable-title course, Genre Studies examines the specific characteristics of individual genres. May be repeated once for credit.
- **ENG-L 695 Individual Readings in English (1-4 cr.)**

- **ENG-L 701 Descriptive Bibliography and Textual problems (4 cr.)** Case-specific analysis of the way that literary texts change, the way these changes are documented by a full and focused history of publication, and the kinds of textual problems caused by the unstable transmission of literary classics down through time. The analytical basis of new scholarly editions.

Writing Courses

- **ENG-W 500 Teaching Composition: Issues and Approaches (4 cr.)** Consideration of fundamental issues in the teaching of writing and the major approaches to composition instruction. Specific topics include teaching invention and revision, diagnosing errors, teaching style and organization, making assignments, and evaluating student writing.
- **ENG-W 501 Practicum on the Teaching of Composition in College (1 – 4 cr.)** Practical teaching of composition; current theories and policies.
- **ENG-W 502 Fields of Editing: Theories and Practices (4 cr.)** An introduction to general copyediting, technical editing, and scholarly editing, the course serves as a prologue to a comprehensive study of manuscript editing. Course content includes the identification and recovery of modern manuscript texts, with an emphasis on physical description, transcription strategies and techniques, and editing of the transcribed text for publication.
- **ENG-W 503 Technologies of Editing: Producing Letterpress and Electronic Texts (4 cr.)** An applied study of contemporary text production, the course examines the standards of accuracy required in professional editing and the way that both text and documentation are prepared for publication. It explores issues of textual preservation, storage, retrieval, and the marketplace as they affect the design and modification of letterpress and electronic texts.
- **ENG-W 508 Graduate Creative Writing for Teachers (4 cr.)** W508 offers current and future teachers insights into the creative process, teaches them to think as writers do, suggests strategies for critiquing creative work, and provides guidance in developing creative writing curriculum. W508 emphasizes hands-on writing activities in three genres, adaptable for use with students at every level.
- **ENG-W 509 Introduction to Writing & Literacy Studies (4 cr.)** This course examines two primary, yet interrelated, threads in postsecondary education: literacy studies and contemporary composition teaching. Students will read, analyze, discuss, and write about key issues in literacy and writing, laying a foundation for further study. The primary goals for this course are for students 1) to understand the theoretical and pedagogical implications of literate activity inside and outside the classroom, 2) to learn how scholars in writing and literacy studies organize their thinking, 3) to recognize different research methods in this field, and 4) to develop skills necessary for professional success in academia.

- **ENG-W 510 Computers in Composition (4 cr.)** Based in current theories about the process of writing, this course surveys the use of computer programs (such as word processing) as writing tools, computer-assigned instruction as teaching aids, and computer programs as research aids to study writing.
- **ENG-W 511 Graduate Fiction Writing (4 cr.)** A graduate-level fiction writing workshop. Seminar study of advanced techniques in the writing of fiction, both short stories and the novel. Workshop discussion of advanced student work in progress.
- **ENG-W 513 Graduate Poetry Writing (4 cr.)** Offers graduate students an intensive experience in reading and writing poetry. Part workshop and part seminar in poetic practice and technique, W513 provides an opportunity for graduate students to expand their poetic range and hone their craft.
- **ENG-W 531 Designing and Editing Visual Technical Communication (4 cr.)** This course explores rhetorical theories guiding visual communication within technical publications, both paper and electronic. In addition, students gain experience in cooperatively designing and editing visually-oriented publications for specific audiences and purposes.
- **ENG-W 553 Theory and Practice of Exposition (1-3 cr.)** Primarily for secondary-school and junior-college teachers of English.
- **ENG-W 590 Teaching Composition: Theories and Application (4 cr.)** Current theories of composition and their pedagogical implications.
- **ENG-W 597 Writing Center Theory and Practice (4 cr.)** Writing Center Theory & Practice is designed to examine the techniques of consulting with writers, as well as the various theories that guide and inform consulting. The course will focus on the practical components of writing center work and how writing center and composition theories can be applied to a variety of settings, including but not limited to college, middle school, high school, professional, and other community settings. In particular, this course will train students to consult with writers in the IUPUI University Writing Center. Specific topics will include writing process, collaborative learning, approaches to consulting, consultant roles, consulting strategies for multiple populations of students (including but not limited to multilingual writers, first-generation students, returning students), cultural divides in writing centers, the use of technology and multimodal composing in writing centers, online consulting, assessment and research in writing centers, and composition and learning theories that influence writing center work and resource development.
- **ENG-W 600 Topics in Rhetoric and Composition (4 cr.)** Covers selected issues in current composition and rhetorical theory. May be repeated for credit with a different topic.
- **ENG-W 605 Writing Project Summer Institute (3-6 cr.)** By application and invitation only. For teachers from K-university, who together consider major issues involved in the teaching of writing and explore the pedagogical approaches inherent in these issues. The institute explores current theories

of writing and their application in the classroom. Preference given to active classroom teachers.

- **ENG-W 609 Directed Writing Projects (1-4 cr.)**
- **ENG-W 615 Writing Creative Nonfiction (4 cr.)** Writing workshop in such modes as personal essay, autobiography, and documentary. Open also to graduate students not in the creative writing program.
- **ENG-W 697 Independent Study in Writing (1-4 cr.)**

Forensic & Investigative Science

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Phone: 317-274-6882; fax: (317) 274-4701

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Department URL: science.indianapolis.iu.edu/forensic/

Curriculum

Courses

Degrees Offered

- Master of Science (M.S.) in Forensic and Investigative Sciences (thesis and non-thesis options; concentrations in Forensic Chemistry or Forensic Biology)
- Doctoral Minor in Forensic Science (for Ph.D. students in related School of Science programs)

Program Description

The M.S. Program in Forensic Science, which awards an Indiana University degree, requires 30 credit hours of study beyond the baccalaureate level. It is designed for students seeking careers as professional forensic scientists who desire employment in the criminal justice field or a related area. There are two ways to complete the M.S. degree: the thesis M.S. or the non-thesis (accelerated M.S.); the M.S. thesis program is FEPAC-accredited.

For both the thesis and non-thesis tracks, students must apply in one of the following concentrations; forensic chemistry or forensic biology. All students take a core of required courses which include crime scene investigation, law, and microscopy coursework. Each concentration and track (thesis or non-thesis) contains specific required courses taken by students in that concentration and track.

This thesis program requires 18 credit hours of course work and 12 credit hours of thesis research. The thesis program culminates in the submission of a written thesis and accompanying oral defense. The thesis program is available to full-time students. The non-thesis program includes 30 credit hours of coursework approved by the program. These 30 credit hours may include up to six credits of internship and research. The non-thesis program may be completed full-time or part-time. Full-time students can complete the non-thesis program in one academic year.

Admission Requirements

How to Apply: Full-Time Thesis M.S.

Application to the program can be completed online. The online application is processed through the Indiana University Graduate Centralized Application System (CAS). You will be directed to create an account to begin

your application. The application can be filled out in stages and saved along the way. The CAS system has provisions for uploading your personal statement and for listing contact names for two letters of recommendation. These contacts will be emailed and asked to submit their recommendation letters. Please arrange for your previous academic institutions to send official, sealed transcripts to FIS Graduate Admissions, 402 N. Blackford St., LD 326, Indianapolis, IN 46202. International applicants will need to provide transcripts in both the native language and English, as well as a certificate of diploma.

The Forensic and Investigative Sciences Program accepts applications once a year for beginning matriculation in the Fall semester. The deadline for applying to the thesis M.S. program is December 15 prior to the year you wish to start. Applications must be complete by January 15 or they will not be considered. Applicants must submit the following:

- **Completed application** (via the Indiana University Graduate CAS system).
- **Two letters of recommendation.** These should normally be from professors who can evaluate your potential to successfully complete graduate work in forensic science.
- **Personal statement.** This statement should discuss your educational and work background, your interest and experience (if any) in forensic science, and (for full-time applicants) your research interests. The supplemental application questions require you to indicate which program (thesis or non-thesis) and which track (forensic biology or forensic chemistry) you are pursuing, and to list your relevant coursework.
- **Official final transcripts** from all higher education institutions you have attended.

Applications are generally reviewed together after the December 15 deadline, and you will be notified by mid-February once a decision is made. If your application is not successful for the thesis program, it will automatically be considered for the non-thesis program.

How to Apply: Non-Thesis M.S.

In the Forensic and Investigative Sciences Program, application is also completed online through the Indiana University Graduate CAS (as described above). The program's review of non-thesis M.S. applications will begin in late February and will continue on a rolling basis until the March 15 deadline. Applications received after March 15 will be considered if positions are available. Applications will also be considered for the Spring term if completed by October 1, provided space is available. Applicants must submit the same materials as listed above (completed application, two letters of recommendation, personal statement, and official transcripts). Applicants will be notified within a few weeks after the decision is made.

Program Learning Outcomes

After completing the M.S. in Forensic and Investigative Sciences, students will be able to:

- Generalize the forensic science system in the United States: Students will be proficient in analyzing and integrating the multifaceted components of the forensic science system in the United

States, spanning crime scene investigation, crime laboratories, organizational structures, specialized disciplines, and the preparation required for a career in forensic science.

- Identify common pattern evidence in forensic science: Students will deconstruct and model the examination of patterned evidence, such as fingerprints, tool marks, physical matches, and firearms, showcasing a deep understanding of the appropriate analytical techniques used for these types of evidence.
- Summarize and demonstrate the use of ethics, bias, criminal and civil laws, rules of evidence, and expert testimony: Students will evaluate and relate the application of ethics, bias considerations, criminal and civil laws, rules of evidence, and expert testimony in the practice of forensic science, demonstrating their critical understanding of these crucial elements.
- Interpret the use of chemical and instrumental techniques in forensic analysis: Students will critically critique and defend the application of chemical and instrumental techniques in forensic analysis, specifically examining common chemical evidence like illicit drugs, fire residue, explosives, inks, and paint.
- Identify and analyze forensic biological evidence: Students will engage in a discriminative analysis of diverse biological evidence types, including bodily fluids and blood spatter, and then synthesize and integrate these analyses, culminating in the interpretation of DNA profiles by applying advanced principles of population genetics.
- Conduct a literature review of a current forensic science topic: Students will generate and structure a comprehensive literature review on a contemporary forensic science topic and present their findings professionally.

Program Requirements

Students must apply in one of the following concentrations; forensic chemistry or forensic biology. All students take a core of required courses which include a professional issues course, law courses, and a microscopy course. Each concentration and track (thesis or non-thesis) contains specific required courses taken by students in that concentration and track. The thesis program requires 18 credit hours of course work and 12 credit hours of thesis completion and defense, and is available to full-time students. A non-thesis option is also available, and this program includes 30 credit hours of classes approved by the department. This may include up to six credits of internship and research.

Courses / Curriculum

All students (thesis and non-thesis) take the following core courses (*course substitutions require Graduate Advisor approval*):

- FIS-I 500 *Crime Scene Investigation and Quality Assurance* (2 cr.)
- FIS-I 510 *Forensic Microscopy Lecture* (1 cr.)
- FIS-I 511 *Forensic Microscopy Lab* (2 cr.)
- FIS-I 550 *Forensic Science and the Law* (3 cr.)
- FIS-I 590 *Forensic Science Seminar* (1 cr.)

Forensic Chemistry concentration (M.S.) – required for thesis and non-thesis students in the *Forensic Chemistry* track:

- FIS-I 505 *Overview of Forensic Biology* (1 cr.)
- FIS-I 520 *Forensic Chemistry I* (3 cr.)
- FIS-I 521 *Forensic Chemistry I Lab* (1 cr.)
- FIS-I 530 *Forensic Chemistry II* (3 cr.)
- FIS-I 531 *Forensic Chemistry II Lab* (1 cr.)

Forensic Biology concentration (M.S.) – required for thesis and non-thesis students in the *Forensic Biology* track:

- FIS-I 515 *Overview of Forensic Chemistry* (1 cr.)
- FIS-I 540 *Forensic Biology I Lecture* (3 cr.)
- FIS-I 541 *Forensic Biology I Lab* (2 cr.)
- FIS-I 560 *Population Genetics* (3 cr.)

Additional Requirements – Thesis Option:

- FIS-I 698 *Thesis Research* (12 cr.)

Additional Requirements – Non-Thesis Option:

- FIS-N 570 *Laboratory Project Design* (2 cr.)
- FIS-N 580 *Forensic Science Laboratory Management* (2 cr.)

Elective Courses (M.S. Non-Thesis)

8 credit hours, selected with approval of the department. This may include up to 6 credits of internship and/or research. Students may also take courses in the other concentration as part of these credits. Approved electives (1–6 cr. each, up to 8 cr. total) are listed below. At least 5 credit hours must be from science courses. Courses from FIS, CHEM, BIOL, ANAT, and BIOC are science courses. ANTH, SPEA, and CJUS courses are not science courses. Other courses can be taken for elective credit with prior approval.

- FIS-N 509 *Forensic Microscopy Lecture*
- FIS-N 500 *Crime Scene Investigation*
- FIS-N 505 *Criminalistics*
- FIS-N 510 *Comparative Sciences*
- FIS-N 515 *Law and Ethics in Forensic Science*
- FIS-N 520 *Death Investigation*
- FIS-N 650 *Forensic Science Research*
- FIS-I 595 *Internship in Forensic Science*
- FIS-I 596 *Special Topics in Forensic and Investigative Sciences* (1–6 cr.). Repeatable under different topics.
- ANAT-D 710 – *History of Anatomy*
- ANTH-A 560 *Forensic Anthropology*
- ANTH-B 526 *Human Osteology*
- BIOC-B 500 *Biochemistry*
- BIOL-I 507 *Principles of Molecular Biology*
- BIOL-I 512 *Advanced Cell Biology*
- BIOL-I 697 *Special Topics in Biology*. Repeatable under different topics.
- CHEM-I 613 *Mass Spectrometry*
- CHEM-I 619 *Electroanalytical Chemistry*
- PSY-I 600 *Statistical Inference*
- PSY-I 601 *Correlation and Experimental Design*
- SPEA-J 582 – *Criminal Justice Systems*
- SPEA-J 501 – *Criminological Thought & Policy*

Other electives may be available on a year-to-year basis. Students should consult the FIS graduate program and obtain approval before registering.

Research (M.S. Non-Thesis)

Non-thesis M.S. students may apply six (6) credit hours of FIS-N 650 *Research in Forensic Science* toward the degree as part of the elective requirements.

Internship / Practicum

Non-thesis M.S. students may apply six (6) credit hours of FIS-I 595 *Internship in Forensic Science* toward the degree as part of the elective requirements.

Transfer Credit

Up to 8 credit hours of graduate course credit may be transferred into the program. To qualify, those credits cannot have previously been used toward a degree or other credential. Second, the course must be at the graduate level. Third, the student must have earned at least a B in the course. Fourth, the course must be relevant to the degree program. Finally, the course may only substitute for a required course if the FIS program deems it equivalent to the required course.

Timeline / Milestones

It is anticipated that the full-time thesis M.S. program can be completed within two years. The accelerated (non-thesis) M.S. program can be completed in one academic year (full-time enrollment).

Doctoral Minor in Forensic Science

The Forensic and Investigative Sciences Program offers a Ph.D. minor in forensic science that requires 6 credit hours of selected course work. The minor provides basic knowledge of the application of science to the forensic science system via graduate coursework from either a chemistry or a biological perspective. This doctoral minor is restricted to School of Science Ph.D. students.

Course Requirements (6 cr.)

Required Courses (two courses, 3 cr. total):

- FIS-I 500 *Crime Scene Investigation and Quality Assurance* (2 cr.)
- Either FIS-I 505 *Overview of Forensic Biology* (1 cr.) (for chemistry-focused students) OR FIS-I 515 *Overview of Forensic Chemistry* (1 cr.) (for biology-focused students)

Elective Courses (total 3 cr., select one or more):

- FIS-I 510 *Advanced Forensic Microscopy Lecture* (1 cr.)
- FIS-I 540 *Forensic Biology* (3 cr.)
- FIS-I 560 *Population Genetics* (3 cr.)
- FIS-I 520 *Forensic Chemistry I* (3 cr.)
- FIS-I 530 *Forensic Chemistry II* (3 cr.)
- FIS-N 570 *Design of a Research Project* (2 cr.)
- FIS-I 550 *Forensic Science and the Law* (3 cr.)

PLEASE NOTE:

- No grade lower than **B** (e.g., B-) is acceptable for any course in the minor.

- A minimum grade point average of 2.00 in minor courses is required.

Courses

Course Descriptions

FIS-I 500 Crime Scene Investigation and Quality Assurance (2 cr.) This course will cover material on crime scene investigation, blood spatter analysis, and various quality assurance/control procedures and recommendations that allow labs to maintain a high degree of confidence in their analyses.

FIS-I 505 Overview of Forensic Biology (1 cr.) This course will cover material on serology, an overview of DNA processing and analysis, and how DNA profiles can be identified via DNA databases.

FIS-I 510 Advanced Forensic Microscopy Lecture (1 cr.) P: FIS-I 300 and FIS-I 301, with a grade of C or better or previous microscopy experience. P: Previous microscopy experience or FIS-I 300. Spring. Discussion of advanced topics in forensic microscopy. This will include review of common forensic laboratory microscopes such as, stereomicroscope, compound light microscope, and polarizing light microscope. The course will include the fundamentals of light, matter, and optics common to microscopy. Introduction to the application of spectroscopy to microscopy will be examined as well as thermal microscopy and comparison microscopy. Discussion on advanced trace evidence analysis will be covered, including impression evidence, plant material, feathers, polymers, and minerals.

FIS-I 511 Advanced Forensic Microscopy Laboratory (2 cr.) C: FIS-I 510. This will be a hands-on laboratory course. During this course, students will perform analysis of trace evidence. This will include a more complex use of light and comparison microscopes and instrumental microscopes. Topics will include mineral content in soil, dispersion of glass particles, physical matches and impressions of trace evidence, polymer identification and microspectrophotometry. Students will also participate in a mock case and trial at the conclusion of the course.

FIS-I 515 Overview of Forensic Chemistry (1 cr.) This course will cover the theory and application of forensic chemistry techniques such as spectroscopy, chromatography, spectrometry, and toxicology.

FIS-N 580 Forensic Science Laboratory Management (2 cr.) Fall. This course focuses on management of forensic science laboratories: various organizational models, budgeting, and common laboratory policies. Differences in the management style for public and private sector laboratories, strategies for employee recruitment, training, and retention, managing workflow and maintaining compliance with accreditation bodies.

FIS-I 520 Chemical Analysis of Alcohol and Drugs (3 cr.) P: Forensic and Investigative Science graduate student or Chemistry graduate student. Fall. This course will focus on the analysis and identification of commonly abused chemicals such as ethanol, controlled substances, and prescription drugs. The history, legal issues, synthesis, chemical/physical properties, and laboratory analysis of these materials will be discussed. Special topics of the students' choosing will also be included in

the form of student presentations. A separate laboratory section will also be offered in which students will complete practical exercises utilizing spectroscopy, chromatography and mass spectrometry that reflect common practice in forensic science laboratories.

FIS-I 521 Forensic Chemistry I Lab (1 cr.) P: Forensic and Investigative Science graduate student or Chemistry graduate student. Pre- or Co-requisite: FIS-I 520 or consent of instructor. Fall. This laboratory section includes practical exercises utilizing spectroscopy, chromatography and mass spectrometry that reflect common practice in forensic science laboratories.

FIS-I 530 Forensic Chemistry II (3 cr.) P: FIS-I 520. Spring. This course will focus on instrumental analysis of trace evidence. Mass spectrometry, chromatography, FT-IR, Raman, SEM-EDX, XRF, and microspectrophotometry will be covered. The application of these techniques to the analysis of toxicological samples and trace evidence (fibers, paint, ignitable liquids, explosives, gunshot residue, and glass) will also be covered.

FIS-I 531 Forensic Chemistry II Lab (1 cr.) P: FIS-I 521 or consent of instructor. Pre- or Co-requisite FIS-I 530. Spring. This laboratory section will include practical laboratory exercises utilizing spectroscopy, chromatography and mass spectrometry that reflect common practice in forensic science laboratories.

FIS-I 550 Forensic Science and the Law (3 cr.) P: Forensic and Investigative Science majors only. Application of various laws and rules of evidence to the forensic sciences and how the admission of evidence derived from forensic sciences can impact the administration of justice in the United States. Topics include preparation for testimony, expert testimony, subpoenas, basic judicial processes, admissibility of scientific evidence.

FIS-I 540 Forensic Biology I (3 cr.) P: Forensic and Investigative Science graduate student or Biology graduate student. Fall. This course is an introduction to the use of biological materials to assign identity to persons associated with a crime. The course will introduce methods for the preliminary detection of biological evidence and introduce the use of DNA. The materials learned will encompass broader topics such as immunology, molecular biology, and genetics.

FIS-I 541 Forensic Biology I Lab (2 cr.) P: or C: FIS-I 540. Fall. This laboratory section includes practical exercises that reflect common practice in forensic science laboratories, including but not limited to collection and preservation of biological evidence, presumptive and confirmatory tests, DNA extraction, and PCR amplification. Open only to graduate students in the Forensic and Investigative Sciences program or by instructor permission.

FIS-I 560 Population Genetics (3 cr.) P: Prerequisite: FIS-I 430; and must be statistics or graduate student in FIS or Biology. Spring. This course will serve as an introduction to the principles of population genetics. The course will cover the theory behind population genetics that includes a historical perspective to the current accepted models of population theory; examine the

relationships between allele and genotype frequencies, and the fundamentals of molecular evolutionary genetics.

FIS-I 596 Special Topics: Forensic and Investigative Sciences (1-6 cr.) Lecture or lecture/lab courses offered on topic areas that are not part of the regular M.S. curriculum. These topics may include firearms and tool marks, questioned documents, forensic pathology, fingerprints, and others. They are electives in the M.S. in Forensic Sciences program.

FIS-I 595 Internship to Forensic Science (1-6 cr.)

The internship provides students with an opportunity to experience the workings of a practicing forensic science laboratory. Although a research project is usually the centerpiece of the internship experience, students will be given an exposure to all sections of the laboratory including case management. Students will also have an opportunity to attend a crime scene as an observer and to attend court to observe a forensic scientist offer expert testimony.

FIS-N 570 Laboratory Project Design (2 cr.) P:

Forensic and Investigative Science majors only. Design of a laboratory study to include a literature search into a forensic science topic, experimental plan, and final presentation, and a grant proposal.

FIS-I 590 Seminar (1 cr.) Spring. Weekly seminars presented by FIS faculty, visiting faculty and FIS graduate students. Required for graduate students admitted into the M.S. in Forensic Science Program. FIS-I 698 Research M.S. Thesis (1-10 cr.) P: Consent of instructor. Credit hours arranged.

FIS-N 520 Death Investigation (3 cr.) This course will provide an overview of forensic death investigations and introduce various techniques to conduct a death investigation. Topics will include forensic taphonomy, forensic entomology, forensic anthropology, forensic archeology, forensic odontology, and forensic pathology. Students will examine traumatic death investigations and perform a mock death investigation.

FIS-N 515 Law & Ethics in Forensic Science (3 cr.) This course will cover an overview of ethical standards required in forensic science. Students will learn about ethical issues in the laboratory and courtroom, be introduced to key court cases influencing forensic research and evidence analysis, and participate in documenting a case involving unethical behavior in the forensic field.

FIS-N 510 Comparative Sciences (3 cr.) This course will cover the history and general concepts of comparative science relating to forensic science. Students will be introduced to comparative science disciplines, such as fingerprints, bullets, impressions, questioned documents, and physical matches, utilized in the forensic field through techniques, procedures, analysis, and evaluation.

FIS-N 505 Criminalistics (3 cr.) This course will introduce the history and investigative methods utilized in forensic science. Cases significant to the evolution of forensic science will be evaluated, discussed. Students will analyze functions and multiple disciplines within a laboratory. Conclusions derived from analysis of evidence will be compared and results conveyed in lay terms.

FIS-N 500 Crime Scene Investigation (3 cr.) This course will introduce students to the investigative techniques

used to conduct a crime scene investigation. Topics include securing and processing a crime scene, collection and preservation of physical evidence, and crime scene reconstruction. Students will develop and gain skills to perform and document a systematic crime scene search.

FIS-N 509 Forensic Microscopy Lecture (1 cr.) P:

Open only to FIS graduate students. Discuss techniques used in the analysis of forensic trace evidence, such as impressions, glass, biological materials, hairs, and fibers. Topics include properties of light, compound microscopy, micrometry, refraction, dispersion, stereomicroscopy, and polarizing light microscopy.

FIS-N 650 Forensic Science Research (1-6 cr.) P:

Requires application and approval of faculty member supervising the research. Independent research course; Forensic Science research focused.

Foundational Biomedical Research

School of Medicine

Departmental E-mail: mebauer@iu.edu, wells4@iu.edu

Departmental URL:

medicine.iu.edu/biochemistry-molecular-biology-pharmacology

medicine.iu.edu/microbiology-immunology

Curriculum

Courses

Program Information

The Master of Science in Foundational Biomedical Research will train students to conduct original research that applies the scientific method to real-world problems of human health and disease. The program emphasizes critical thinking skills, development of testable hypotheses grounded in the current literature, experimental design and hands-on testing of hypotheses, appropriate analysis and interpretation of data, and scientific communication of findings. This shared preparation provides a strong foundation in biomedical inquiry and analysis that is applicable to multiple fields of scientific study. Building on this foundation, students will pursue focused study and thesis research in an approved specialization field within the biomedical sciences. The program culminates in a scholarly experience that demonstrates readiness for advanced roles in biomedical research and related industries.

Degrees Offered

Master of Science

Admission Requirements

A baccalaureate degree with undergraduate courses in basic biology, including cell biology and genetics, general and organic chemistry, and calculus, is recommended for admission into this program. Applicants will select a specialization track when applying and must be admitted by that specialization track in order to matriculate. Specialization tracks include:

- Biochemistry and Molecular Biology
- Microbiology and Immunology

Program Student Learning Outcomes

- **Foundational Biomedical Knowledge.** Graduates will be able to integrate foundational biomedical science concepts to explain mechanisms relevant to human health and disease and to frame relevant biomedical questions.
- **Research Design and Inquiry.** Graduates will be able to formulate researchable questions and design methodologically and ethically sound approaches to biomedical inquiry, demonstrating appropriate selection and justification of research methods.
- **Critical Analysis of Research Data.** Graduates will be able to apply analytical reasoning skills and appropriate statistical analyses to accurately interpret biomedical data and evaluate limitations resulting in their being able to draw appropriate conclusions from their research.
- **Scientific Communication.** Graduates will be able to communicate foundational biomedical knowledge, research approaches, and findings to professional audiences.

Specialization track PLOs:

BMB-PLO-1 Graduates of the Biochemistry and Molecular Biology track will be able to incorporate advanced knowledge in biochemistry and molecular biology into high-level scientific investigation of current research topics in biochemistry and molecular biology.

MCIM-PLO-1 Graduates of the Microbiology and Immunology track will be able to apply in-depth, advanced knowledge of the human immune system and infectious diseases to investigate immune system functions and host-pathogen interactions.

Degree Course Requirements

The MS in Foundational Biomedical Research includes required core courses (17 credits total) covering the conduct of a thesis research project along with didactic course work in scientific writing, research ethics, reading scientific literature, and biostatistics. Each specialization track also has required and elective course work (13-14 cr).

Required Core Course Work (17 cr total), to be taken by all students, regardless of specialization track:

- Research course work (12 cr total), students will take one of the following:
 - BIOC-B 855 Research
 - MICR-J 810 Research in Microbiology
- Scientific writing course work (2 cr), students will take one of the following:
 - BIOC-B 811 Advanced Intermediate Metabolism
 - MICR-J 800 Advanced Microbiology
- GRDM-G 505 The Responsible Conduct of Research (1 cr)
- GRDM-G 700 Translating Foundational Science to Contemporary Knowledge (1 cr)

- GRDM-G 855 Experimental Design and Biostatistics (1 cr)

Specialization track: Biochemistry and Molecular Biology (13-14 cr total)

- Required Courses (13-14 cr):
 - One of the following two courses (2-3 cr total)
 - GRDM-G 715 Biomed I-Biochemical Basis of Biological Processes (2 cr)
 - BIOC-B 500 Introduction to Biochemistry (3 cr)
 - GRDM-G 716 Biomed II Molecular Biology & Genetics (2 cr)
 - GRDM-G 828 Concepts in Biotechnology (2 cr)
 - BIOC-B 854 Introduction to Research (1 cr)
 - Two semesters of the following course (2 cr total):
 - BIOC-B 890 Biochemistry Seminar (1 cr)
- Elective courses: take two of the following courses (4 cr total):
 - GRDM-G 805 Diabetes and Obesity (2 cr)
 - GRDM-G 807 Structural and Chemical Biology (2 cr)
 - GRDM-G 817 Cell Biology (2 cr)
 - GRDM-G 826 Synthetic Biology and biologics (2 cr)
 - GRDM-G 848 Bioinformatics (2 cr)
 - GRDM-G 852 Cancer Biology (2 cr)
 - GRDM-G 825 Advanced Topics in Molecular Biology (2 cr)

Specialization track: Microbiology and Immunology (13 cr total)

- Required course work (6 cr total):
 - One of the following courses (2 cr total):
 - GRDM-G 715 Biomed I-Biochem Basis of Biological Processes (2 cr)
 - GRDM-G 716 Biomed II-Molecular Biology & Genetics (2 cr)
 - GRDM-G 717 Biomed III-Cellular Basis of Systems Biology (2 cr)
- Four credits from the following courses (4 cr total):
 - GRDM-G 720 Stem Cell Biology (2 cr)
 - GRDM-G 728 Fund Concepts of Infection and Pathogenesis (1 cr)
 - GRDM-G 729 Immunology I (1 cr)
 - GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr)
 - MICR-J 807 Current Topics in Immunology (2 cr)
 - MICR-J 815 Current Topics in Viral Immunology (2 cr)
 - MICR-J 829 Current Topics in Molec Genetics of Microorganisms (2 cr)
- Elective courses (7 cr total):
 - Any graduate level (500+) course work from within the Microbiology

and Immunology (MICR) or Graduate Medicine (GRDM) subject areas

Degree Plan of Study

Plan of Study: Biochemistry and Molecular Biology Specialization Track (30 cr total)

- Fall course offerings:
 - Required Core Courses:
 - GRDM-G 505 The Responsible Conduct of Research (1 cr)
 - GRDM-G 700 Translating Found Science to Contemp Knowledge (1 cr)
 - GRDM-G 855 Experimental Design and Biostatistics (1 cr)
 - Track-specific required courses:
 - Take one:
 - GRDM-G 715 Biomed I-Biochem Basis of Biolog Process (2 cr)
 - BIOC-B 500 Introduction to Biochemistry (3 cr)
 - GRDM-G 716 Biomed II Molecular Biology & Genetics (2 cr)
 - BIOC-B 890 Biochemistry seminar (1 cr)
 - BIOC-B 854 Introduction to Research (1 cr)
 - GRDM-G 828 Concepts in Biotechnology (2 cr)
 - Track-specific elective courses:
 - GRDM-G 805 Diabetes and Obesity (2 cr)
 - GRDM-G 825 Advanced Topics in Molecular Biology (2 cr)
 - Spring course offerings:
 - Required Core Courses:
 - BIOC-B 855 Research
 - Track-specific required courses:
 - BIOC-B 890 Biochemistry seminar (1 cr)
 - Track-specific electives
 - GRDM-G 807 Structural and Chemical Biology (2 cr)
 - GRDM-G 817 Cell Biology (2 cr)
 - GRDM-G 826 Synthetic Biology and biologics (2 cr)
 - GRDM-G 848 Bioinformatics (2 cr)
 - GRDM-G 852 Cancer Biology: Signaling Gone Awry (2 cr)
 - Summer course offerings:
 - BIOC-B 855 Research
 - BIOC-B 811 Advanced Intermediate Metabolism

Plan of Study: Microbiology and Immunology Specialization Track (30 cr total)

- Fall course offerings:
 - Required Core Courses:

- GRDM-G 505 The Responsible Conduct of Research (1 cr)
- GRDM-G 700 Translating Found Science to Contemp Knowledge (1 cr)
- GRDM-G 855 Experimental Design and Biostatistics (1 cr)
- MICR-J 810 Research in Microbiology
- Track-specific required courses (take one):
 - GRDM-G 715 Biomed I-Biochem Basis of Biological Processes (2 cr)
 - GRDM-G 716 Biomed II Molecular Biology & Genetics (2 cr)
 - GRDM-G 717 Biomed III-Cellular Basis of Systems Biology (2 cr)
- Track-specific elective courses (take 0-4 cr):
 - MICR-J 807 Current topics in Immunology (2 cr)
 - MICR-J 815 Current topics in Viral Immunology (2 cr)
 - MICR-J 829 Current topics in Molec Genetics of Microorganisms (2 cr)
- Spring course offerings:
 - Required Core Courses:
 - MICR-J 800 Advanced Microbiology
 - MICR-J 810 Research in Microbiology
 - Track-specific electives:
 - GRDM-G 720 Stem Cell Biology (2 cr)
 - GRDM-G 728 Fund Concepts of Infect and Pathogenesis (1 cr)
 - GRDM-G 729 Immunology I (1 cr)
 - GRDM-G 852 Cancer Biology: Signaling Gone Awry (2 cr)
 - Summer course offerings:
 - Students may optionally take MICR-J 810 Research in Microbiology during the Summer session. Once 30 credits are completed, students may seek permission to enroll in GRAD-G 510 Master's Advanced Progression and Analysis while completing the degree.

Grades

An overall average of at least a B (3.0). Only 3 credits of C (2.0) can be counted toward the required credits of didactic coursework.

Thesis

Required.

Final Examination

Oral defense of thesis.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

BIOC-B 500 Introduction to Biochemistry (3 cr.): P: C341 or equivalent. Structures of carbohydrates, proteins, lipids, and nucleic acids. Basic principles of enzyme catalysis, protein synthesis, intermediary metabolism, and nutrition.

BIOC-B 811 Advanced Intermediate Metabolism: P: B810. Tutorial instruction in specialized areas of metabolism.

BIOC-B 854 Introduction to Research (1 cr.) Introduces three research programs via tutorial/lab instruction.

BIOC-B 855 Research

BIOC-B 890 Biochemistry Seminar (1 cr.)

MICR-J 800 Advanced Microbiology The approach to problems in microbiology including the application of techniques of bacteriology, genetics, immunology, mycology, parasitology, virology, and zoology.

MICR-J 807 Current Topics in Immunology (2 cr.) Discussion and review of current literature in selected topics in immunology. Emphasis on molecular and cellular events in lymphocyte activation and regulation. Topic varies from year to year.

MICR-J 810 Research in Microbiology Data obtained in this course may be used to meet the thesis requirements for graduate degrees.

MICR-J 815 Current Topics in Viral Immunology (2 cr.) This course is designed to teach students historical and cutting-edge concepts in the study of immune responses to viral infections. Faculty members will lecture on the assigned topics and will lead a discussion of related primary research articles during the class period.

MICR-J 829 Current Topics in Molecular Genetics of Microorganisms (2 cr.) In-depth study of a specific topic in contemporary molecular genetics of microorganisms. Topics varies.

GRDM-G 505 The Responsible Conduct of Research (1 cr.) An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 700 Translating Foundational Science to Contemporary Knowledge (1 cr.) G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then through discussion of an assigned paper from the primary literature.

GRDM-G 715 Biomed I-Biochemical Basis of Biological Processes (2 cr.) One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including

biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G 716 Biomed II-Molecular Biology & Genetics (2 cr.) Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G 717 Biomed III-Cellular Basis of Systems Biology (2 cr.) Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G 720 Stem Cell Biology (2 cr.) This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external other external stimuli, and what their clinical capabilities are and might be.

GRDM-G 728 Fundamental Concepts of Infection and Pathogenesis (1 cr.) This course will cover concepts of host-pathogen interactions ranging from pathogen entry, growth and spread in the host to pathogen and mediated injury, immune evasion, pathogen survival strategies and transmission to new hosts. Basics of bacterial, viral and parasitic structures will be considered as they relate to pathogenesis.

GRDM-G 729 Immunology I (1 cr.) An introductory biomedical science, lecture-based core course intended for all incoming basic science graduate doctoral students in the School of Medicine programs or other interested graduate students. The course will cover components of the immune system development of the immune system, the immune response to pathogens and immunological disease.

GRDM-G 805 Diabetes and Obesity (2 cr.) Biochemistry, cell biology, molecular biology, genetics, immunology and pathophysiology of diabetes and obesity. Topics include metabolic regulation, signal transduction, insulin resistance, insulin production, beta-cell function, animal models, complications, nutrition, prevention and therapy.

GRDM-G 807 Structural and Chemical Biology (2 cr.) Fundamentals of structural and chemical biology focused on state-of-the art approaches to inhibitor discovery, use of inhibitor in elucidating biological function, and computational and structural approaches to rational inhibitor design.

GRDM-G 817 Cell Biology (2 cr.) Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 825 Advanced Topics in Molecular Biology (2 cr.) The course will highlight selected topics adjusted

each year to reflect the most current advancements in molecular biology and will include lectures and paper discussions on: Chromatin structure and regulation; Transcriptional control; RNA structure and processing; RNAi and miRNA; RNA decay; Translational control and its integration in gene expression.

GRDM-G 826 Synthetic Biology and Biologics (2 cr.) This course will explore synthetic biology approach by which the cell biological, molecular, and metabolic changes can be introduced into model systems to allow for both faithful expression and high abundance of heterologous proteins as well as heterologous small molecules.

GRDM-G 828 Concepts in Biotechnology (2 cr.) Case studies exploring topics on the cutting edge of biotechnology and tutorials in biotechnology calculations.

GRDM-G 848 Bioinformatics (2 cr.) Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which in turn have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.) Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G 855 Experimental Design and Biostatistics (1 cr.) This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

Geography

School of Liberal Arts

Departmental email: geogdept@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/geography/

Curriculum

Degrees Offered

Graduate Certificate in Geographic Information Science (GIS)

Program Information

This program is for students wanting to advance their career with in-demand geospatial skills. The Graduate Certificate in Geographic Information Science (GIS) allows students the opportunity to work with spatial data in ways that help organizations make smarter decisions—whether in urban planning, environmental science, public health, business analytics, or any field that relies on mapping and location-based insight.

Admission Requirements

1. Bachelor's degree and transcripts from all colleges and or universities attended, with an overall undergraduate GPA of at least 3.0. Appropriate work experience will also be taken into account in making decisions about admission.
2. Three letters of recommendation
3. Personal statement
4. International students must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317- 274-7000.
5. The following deadlines must be observed in order to receive consideration for admission:

March 1 - for summer and fall semester

October 15 - for spring semester

Bachelor's degree from an accredited institution. Recommended minimum undergraduate GPA of 3.0. Appropriate work experience will also be taken into account in making decisions about admission. Three letters of recommendation and a personal statement.

Course Requirements

The Graduate Certificate in Geographic Information Science is a minimum of 15 credit hours. The minimum grade that will be accepted in any single course is B-.

Required courses (9 cr.)

GEOG-G 535 Intro to Remote Sensing and Air Photo Interpretation (3 cr.)

GEOG-G 538 Introduction to Geographic Information Systems (3 cr.)

GEOG-G 639 Seminar in Geographic Information Science

Electives (6 cr.)

GEOG-G 536 Advanced Remote Sensing and Digital Image Processing (3 cr.)

GEOG-G 537 Computer Cartography and Graphics (3 cr.)

GEOG-G 539 Advanced Geographic Information Systems (3 cr.)

GEOG-G 588 Spatial Statistics (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **GEOG-G 502 Introduction to Transportation Analysis (3 cr.)** Examination of movement of people, goods, and information over space using spatial analysis and planning techniques.
- **GEOG-G 535 Introduction to Remote Sensing (3 cr.)** Principles of remote sensing of the earth and its atmosphere, emphasizing satellite data in visible, infrared, and microwave portions of the electromagnetic spectrum. Emphasis on practical

applications and digital image analysis. A satellite data analysis project is required.

- **GEOG-G 536 Advanced Remote Sensing: Digital Image Processing (3 cr.)** P: G535 or consent of instructor. Advanced remote sensing theory and digital image processing techniques with an emphasis on environmental science applications. Hands-on computer exercises provide significant experience in digital image processing techniques for extraction of qualitative and quantitative information about Earth's terrestrial and aquatic environments.
- **GEOG-G 537 Computer Cartography and Graphics (3 cr.)** Compilation, design, production, and evaluation of maps and related graphic materials. Includes cartometric procedures, symbolization, color use guidelines, map typography, photographic manipulations, computer animation, and geographic visualization techniques.
- **GEOG-G 538 Geographic Information Systems (3 cr.)** Overview of the principles and practices of Geographic Information Systems (GIS). Spatial data models, database design, introductory and intermediate GIS, operations and case studies of real-world GIS applications. Laboratory exercises will provide significant hands-on experience. Lecture and laboratory.
- **GEOG-G 539 Advanced Geographic Information Systems (3 cr.)** P: G538 or consent of instructor. Intermediate and advanced topics in geographic information science and spatial analysis techniques using GIS software. This advanced course is for students who seek a greater understanding of this rapidly developing field and to learn how to construct, manage, and analyze their own GIS data and models.
- **GEOG-G 560 Geography Internship (1-4 cr.)** P: Graduate level courses in geography and consent of instructor. Faculty-directed study of geographical problems based on an internship experience. Student's area of placement must be related to major field of study. Offered fall, spring, and each summer session. Student may complete more than one internship, but total credit earned cannot exceed 4 credit hours.
- **GEOG-G 578 Global Change, Food and Farming Systems (3 cr.)** Introduction to food production and consumption systems, emphasizing linkages to land use and social change on food/farming system sustainability. Topics include: urbanization population growth and economic liberalization; farming livelihoods, gender and poverty; biotechnology; agro-ecology; global health.
- **GEOG-G 588 Applied Spatial Statistics (3 cr.)** P: Consent of instructor. Extension of Traditional Statistical analysis to spatial data. Spatial means and spatial variances, the examination of differences in samples over space, spatial autocorrelation, nearest neighbor analysis, map comparison techniques. Emphasis on practical applications.
- **GEOG-G 602 Seminar (1 – 3 cr.)** Topics will vary to consider aspects of climate, land and environmental change.
- **GEOG-G 639 Topical Seminar in Geographic Information Science (3 cr.)** Applications of

geographic information science principles in the collection and analysis of spatial data. Integration of GIS, remote sensing, and GPS technologies. Review of current literature on techniques, theory, technology, and applications with an emphasis on environmental topics. Discussion, laboratory, and research project.

- **GEOG-G 704 Soils Geography (3 cr.)** P: G538. Examines the spatial aspects of soils from a global and local perspective including soil genesis, morphology, and classification; physical, chemical, mechanical and biological properties of soil; and land use mapping, analysis, planning, and management.

Ph.D. Minor in Global Health

Richard M. Fairbanks School of Public Health

Program E-mail: fsphinfo@iu.edu

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctors/minors/global-health

The IU Richard M. Fairbanks School of Public Health offers a PhD minor in Global Health that provides students with a foundation in the identification and control of environmental hazards that can adversely affect human health and environmental quality.

People who possess these specialized skills are in high demand due to the ever-growing focus on how the natural and built environments impact population health.

The doctoral minor in Global Health is comprised of a minimum of 12 credits and serves as a useful complement to many major areas of study. You will learn both theoretical concepts of environmental public health and how to apply these concepts in assessing environmental health risks, collecting and analyzing data, and developing policy.

Because you can choose three of the courses from a list of options, you can easily customize this minor to your unique interests and needs. This minor is ideal for students from many schools, including the IU schools of Nursing, Medicine, Science, Business, and Public and Environmental Affairs.

Students who wish to obtain a doctoral minor from the IU Richard M. Fairbanks School of Public Health must earn a grade of "B" or better in the coursework for the minor. Courses in which a grade of "B-" or lower is earned will not apply toward completion of the minor. Faculty in the department of Global Health will serve as advisors for students choosing this minor.

Curriculum

Curriculum (12 credit hours)

Choose four courses for 12 credit hours.

- PBHL-A 641 Introduction to Global Health and Sustainable Development (3 credits)
- PBHL-A 664 Introduction to Global Health Diplomacy (3 credits)
- PBHL-A 668 Global Health Policy Analysis (3 credits)
- PBHL-S 630 Global Maternal and Child Health (3 credits)

- PBHL-A 550 London Study Abroad (3 credits)
- PBHL-A 551 Sweden Study Abroad (3 credits)
- PBHL-A 558 Israel Study Abroad (3 credits)
- PBHL-A 553 Geneva Study Abroad (3 credits)

*A maximum of (2) study abroad courses can be applied toward the 12-credit hour minor.

Other courses may be taken if approved by the student's minor advisor. Students who have already completed any of the required courses as part of their MPH or PhD requirements may not apply those courses toward their minor in Global Health and must instead work with their faculty advisor to identify alternate GH courses.

The student's minor advisor will monitor satisfactory completion of the requirements for the doctoral minor in Global Health. Doctoral students must notify the Fairbanks School of Public Health before beginning their course of study for the minor.

Courses

- **PBHL-A 641 Introduction to Global Health and Sustainable Development (3 credits):** Cycles of instability, conflict, and ineffective governance impede sustainable development, thereby limiting advances in preventable disease, injury, and death. In this course, we will explore the global landscape of morbidity and mortality, its connectedness to security and prosperity, and the investments and partnerships needed to ensure sustainable development, health, and well-being.
- **PBHL-A 664 Introduction to Global Health Diplomacy (3 credits):** Global Health Diplomacy significantly contributes to domestic and international health security. This graduate-level course introduces students to basic concepts of global health diplomacy, their relevance for effective global health leadership, and their applications in practice in varied organizational settings around the world. Students will develop basic global health diplomacy skills.
- **PBHL-A 668 Global Health Policy Analysis (3 credits):** Health policymaking is a complex process that varies around the world. It is affected by such factors as governance structures and systems, the relative influence of stakeholder groups, and the policy and cultural contexts including political, economic, social and organizational conditions.
- **PBHL-S 630 Global Maternal and Child Health (3 credits):** The impact of global maternal and child health (MCH) conditions at different stages of the life cycle, and their functional biopsychosocial outcomes will be explored. Students will explore the different contexts that influence global MCH as well as intervention and policy strategies that optimize MCH.
- **PBHL-A 550 London Study Abroad (3 credits):** This course provides an in-depth introduction to a global model for health services delivery and provides students with the opportunity to compare and contrast systems in England and the United States. Participants will spend substantial time out in the field visiting London-area health facilities, historical sites, and universities.
- **PBHL-A 551 Sweden Study Abroad (3 credits):** This course provides an introduction to a

globally admired model for health services delivery and provides students with the opportunity to compare and contrast systems in Norway, Sweden, and the United States. Participants will spend substantial time out in the field visiting area health facilities, historical and cultural sites.

- **PBHL-A 558 Israel Study Abroad (3 credits):** This course provides an in-depth introduction to a global model for health services and provides students with the opportunity to compare and contrast systems in Israel and the US. Participants will spend time out in the field visiting Tel health facilities, historical sites, cultural locations in Tel Aviv and Jerusalem.
- **PBHL-A 553 Geneva Study Abroad (3 credits):** This course introduces global organizations responsible for supporting health leadership and health systems strengthening worldwide. Participants will spend time in the field with health experts from the World Health Organization, leading NGOs, private corporations, higher education institutions, and UN agencies that work closely with WHO improving health around the world.

Health Communication

School of Liberal Arts

Department of Communication Studies

Departmental E-mail: commdept@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/communication-studies

Curriculum

Degrees Offered

Doctor of Philosophy in Health Communication, Ph.D.
Minor in Health Communication

Doctor of Philosophy in Health Communication

The Ph.D. program in Health Communication includes the following main program objectives. Students will:

- Obtain competency for teaching and research in the areas of health and interpersonal relationships, intercultural health, and mediated communication in healthcare contexts, including health campaign development. Ethical questions regarding each of these health communication contexts will be explored as well.
- Initiate, participate, and develop competency in research on health and medical communication issues.
- Gain skills in understanding clinical problems affected by communication.
- Develop the capabilities necessary to translate research on clinical problems impacted by communication into practice.
- Receive training for academic jobs and healthcare professional positions.

Required Coursework

- Students entering the program must have at least a master's degree (minimum of 30 credit hours) in Communication or a related social science or

health discipline. Preference will be given to those students with degrees from Communication Studies programs.

- Students should have a GPA of 3.5 or higher in their master's coursework.
- Students are expected to have taken some foundational coursework in Communication. For students entering the program with no background in Communication, additional preparatory coursework in the discipline may be required as a condition of admission.

Required Testing

- International applicants must submit Test of English as a Foreign Language (TOEFL) or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317- 274-7000. The expectation for admission is a minimum score of 88 on the TOEFL iBT (internet based test). Please note that this score represents the minimum that will be considered. In practice, we look for scores above 100.
1. • International English Language Testing System (IELTS). The minimum acceptable IELTS score is 6.5; in practice, we look for an IELTS of 7 or more. It is required that applicants take the *academic* reading and writing modules, not the *general training* reading and writing modules. Please note that this score represents the minimum that will be considered.

Additional Required Materials

- A written statement of purpose for entering this Ph.D. program
- Three letters of recommendation from individuals in professional positions able to judge success
- Curriculum vitae
- Graduate and undergraduate transcripts from all colleges and universities attended
- A writing sample demonstrating academic writing ability

Undergraduate Record

Graduate School requirements include a bachelor's degree and transcripts from all universities and colleges attended, with a minimum 3.0 grade point average on a scale of 4

Applications will be viewed in their entirety. A candidate's outstanding qualifications in one area can be balanced against more marginal qualifications in another dimension. Keep in mind that admission is competitive and financial support even more competitive. Most of the students admitted and supported will exceed the minimal requirements.

Degree Requirements

IU requires a minimum of 90 credit hours of approved graduate coursework beyond the bachelor's degree. A maximum of 30 credit hours of approved graduate work completed with a grade of B or better may be transferred with the approval of the Advisory Committee and the

Dean of the Graduate School. All coursework taken for the Ph.D. must be completed within seven years prior to the passing of qualifying exams, including any transfer courses. Coursework that does not meet this criterion may be revalidated.

Overall, the requirements include core courses (18 credit hours), seminars in content areas focused on (but not limited to) interpersonal relationship communication, intercultural communication, mediated/campaign communication (at least 12 credit hours), minor (12 credit hours), field work/research (6-9 credit hours), and dissertation credits (12 credit hours).

Students must earn a grade of B or better in all coursework and maintain a program GPA of at least 3.0.

Core Courses (18 cr.)

- COMM-C 500 Advanced Communication Theory (3 cr.)
- COMM-C 504 Professional Seminar in Communication Graduate Studies (3 cr.)
- COMM-C 592 Advanced Health Communication (3 cr.)
- COMM-C 680 Doctoral Qualitative/Rhetorical Methods (3 cr.)
- COMM-C 690 Doctoral Quantitative Methods (3 cr.)
- COMM-C 695 Seminar in Communication and Healthcare (3 cr.)

Seminars in Content Areas (at least 12 credit hours)

- Students should consult the Plan of Study for seminar course options in Communication and should select from these options. Other cross-listed seminars from affiliated faculty in departments or programs such as the Indiana Center for Intercultural Communication (I.C.I.C.), Medical Humanities, Medical Sociology, and other health-related areas may count toward the student's degree with approval from the student's advisor.

Minor Area of Emphasis (12 credit hours): All students must complete a doctoral minor in an area related to their primary health communication focus. For example, a student hoping to work in a non-profit health organization might pursue a minor area of emphasis in public health, health informatics, or philanthropic studies. Students hoping to work in the government sector might pursue law and health, industrial organizational psychology, or public health. Minor areas of Ph.D. study might also include bioethics, nursing, bioinformatics, clinical psychology, medical sociology, marketing, social work, health economics, science, or any area in the health and life sciences disciplines or the Liberal Arts disciplines connected to the student's area of primary focus. An interdisciplinary, individualized minor can also be developed in consultation with the student's minor advisor. The minor area of emphasis must be approved by the student's minor advisor and Advisory Committee

Comprehensive Examinations: All students must take written examinations that cover both broad knowledge of the health communication field as well as specialized knowledge of a chosen area of health communication. Comprehensive exams are taken after the student has completed a minimum of 39 credit hours (beyond the

master's) including the required core, seminars, and minor coursework.

Fieldwork /Research (6-9 credit hours): All students are required to initiate or participate in original research with the approval of their advisor. This field/research work is geared to focus the student's research interest to serve as a spring-board for the dissertation work.

Ph.D. Dissertation (12 credit hours): Dissertation credits are structured so that the student is unencumbered with completing coursework and can focus completely on conducting research and writing the dissertation for completion of the degree.

Doctoral Minor in Health Communication

Health communication is a rapidly growing field that contributes to the knowledge of and improvement in the delivery of healthcare. Students selecting this Ph.D. minor will study areas such as patient advocacy, empowerment and activation, patient-provider communication, shared decision-making, patient-caregiver communication, successful transfers of care among clinicians, communicative approaches to reducing healthcare disparities, and addressing clinician burnout.

Health communication scholarship adds unique and important dimensions to the study of healthcare and its delivery in a variety of fields, including public health, nursing, psychology, biomedical informatics, rehabilitation science, and other disciplines.

Each student must take 12 credit hours of Health Communication courses to complete the minor. All courses must be at the 500-level or higher and must be completed with a grade of B or better. All graduate courses taken online must be taught by an IU Indianapolis faculty member.

Doctoral Minor Requirements

Required Courses (6 cr.)

COMM-C 500 Advanced Communication Theory (3 cr.)

COMM-C 592 Advanced Health Communication (3 cr.)

Elective Courses selected from the following (6 cr.)

COMM-C 510 Health Provider-Consumer Communication (3 cr.)

COMM-C 591 Topics/Seminar in Applied Communication (3 cr.)

COMM-C 650 Health Communication Media (3 cr.)

COMM-C 695 Communication and Healthcare (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **COMM-C 500 Advanced Communication Theory (3 cr.)** Students explore how scholars from various traditions have described and explained the universal human experience of communication. Students develop an understanding of a variety of communication theories to more completely interpret events in more flexible, useful, and discriminating ways.
- **COMM-C 501 Applied Quantitative Research Methods in Communication Studies (3 cr.)** The course is designed to offer an opportunity to examine, assess, and conduct quantitative research that employs communication theory and quantitative research methods as a means to test theory in applied settings and/or as a means to applied ends (i.e., problem-solving policy analysis).
- **COMM-C 502 Applied Qualitative Research Methods in Communication Studies (3 cr.)** P: 6 credits (at any level) of coursework in Communication Studies. Inductive (data-to-theory) approach to knowledge, and associated sequential and non-sequential methods for studying communication in applied everyday situations, e.g., friendships and other close personal dyads, families, small groups, organizations, and public, media, historical, computer mediated, or health-related contexts.
- **COMM-C 503 Applied Learning Project (3 cr.)** An applied learning project that provides students with a culminating educational experience. The project gives students the opportunity to apply their knowledge of communicative processes to real-life organizational problems, and provides the opportunity to produce a body of work reflecting their abilities.
- **COMM-C 504 Professional Seminar in Communication Graduate Studies (3 cr.)** The course provides an orientation to graduate school expectations and a stronger grasp of the diverse approaches (methods) to constructing knowledge via Communication Studies Research. Students will be expected to perform at graduate level standards in writing for an academic audience, thinking and arguing critically, and analyzing/synthesizing published research.
- **COMM-C 505 Proseminar in Communication Studies Pedagogy (1 cr.)** This course is designed to provide students with a survey of the concepts and strategies for effective pedagogy in communication. Emphasis is placed on building skills and confidence in designing lessons, using appropriate instructional and assessment strategies, and developing a unique and coherent teaching philosophy.
- **COMM-C 510 Health Provider-Consumer Communication (3 cr.)** Designed to teach communication skills and practices related to health care talk by examining transactional communication within health care contexts. Topics covered in this course focus directly upon interpersonal dialogue between health care providers and patients.
- **COMM-C 520 Advanced Public Communication (3 cr.)** Theory and application of oral communication integral to institutional and corporate professionals. Critical analysis of representative manuscripts of American speechmaking, and development and presentation of forms and types of public address for professionals.
- **COMM-C 521 Family Comm in Health Contexts (3 cr.)** This interdisciplinary seminar focuses on communication involving families in health care

settings, addressing significant issues for graduate/professional students who will work with families, including students in Comm. Studies, Nursing, Psychology, Social Work, Public Health, and Medicine. Topics include communication with families about health care concerns and family-patient-health provider systems.

- **COMM-C 526 Effective Media Strategies (3 cr.)** This course specifically focuses on the effective use of media as a means of persuasion. This course explains how ideas are expressed through techniques unique to the language of radio, television, film, and the Internet.
- **COMM-C 528 Group Communication and Organizations (3 cr.)** This seminar-format course examines the ways in which informal groups and communication networks facilitate a variety of organizational processes (i.e., socialization, diffusion of innovation). Emphasis is placed on developing theoretical understanding of informal groups in organizations as well as on methodological issues involved in studying communication networks in organizations.
- **COMM-C 530 Communication Criticism (3 cr.)** This course will introduce students to criticism as a method of studying persuasive messages in speeches, fiction, mass media, musical lyrics, political campaign literature, art, and other modes of communication in contemporary culture.
- **COMM-C 531 Media Theory and Criticism (3 cr.)** A course organized primarily around theories and critical strategies commonly considered within the broad category of contemporary criticism. The course utilizes primary theoretical texts to introduce students to a variety of methodologies employed in analyzing media messages, and emphasizes the application of theoretical frameworks on the analysis of specific media texts.
- **COMM-C 533 Improvisation for Scientists (1 cr.)** Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.
- **COMM-C 534 Distilling Your Message (1 cr.)** Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.
- **COMM-C 535 Advanced Science and Research Communication (3 cr.)** Students will explore the social construction of expertise and discuss how rhetorical and narrative theory informs communication. Via community-based projects, students will collate, synthesize, and translate scientific evidence into information that non-expert audiences (such as policy makers, granting organizations, and the lay public) can access, understand, and act on.
- **COMM-C 536 Connecting with the Community (1 cr.)** Students will theorize and develop techniques for shared meaning-making with community

partners. They test methods to develop common ground between experts and community members including the lay public and policy makers. Activities focus on developing trust, open communication, and sharing expertise that values and respects lived experiences of community members.

- **COMM-C 544 Advanced Relational Communication (3 cr.)** An introductory course in interpersonal communication. Applications of communication theory/research in such areas as relational culture and relationship development. Includes a scholarly project on a real relationship, and applications of research to areas such as pedagogy and couple/family therapy.
- **COMM-C 580 Advanced Organizational Communication (3 cr.)** The course provides a solid foundation of concepts for understanding and discussing human organizations. Students will analyze, evaluate, and apply the theories and practices related to organizational issues. Through case studies, readings, and practical applications, this course combines a theory-based understanding of communication in organizations with real-world applications.
- **COMM-C 582 Advanced Intercultural Communication (3 cr.)** Exploration of issues related to the intercultural communication process. Consideration of the role of social, cultural, and historical contexts in intercultural interactions. Examination of the relationship between culture and communication from the socio-psychological, interpretive, and critical perspectives.
- **COMM-C 591 Topics/Seminar in Applied Communication (3 cr.)** This is a revolving topics course. The changing nature of the topic allows graduate students to explore, synthesize, and integrate knowledge of the field of communication and the particular discipline of applied communication while focusing on a single topic not otherwise addressed in the course of study.
- **COMM-C 592 Advanced Health Communication (3 cr.)** A course designed to teach communication skills and practices related to health care by examining health care communication theory. Topics range across communication levels (interpersonal, intrapersonal, group, organization, mass media, and mediated communication) within a variety of health care contexts.
- **COMM-C 593 Advanced Family Communication (3 cr.)** Applications of theory and research on the role of communication in creating and maintaining marriages/committed couples and families. Includes a scholarly term paper on a real couple or family's communication.
- **COMM-C 594 Communication and Conflict Management in Organizations (3 cr.)** This seminar-format course examines the communication exchanges that facilitate conflict management within organizational contexts. Specific attention is focused on negotiation and mediation; however, the communication of alternative means of conflict and dispute resolution are also discussed. In addition, students will be introduced to methods for assessing conflict interaction in organizations.

- **COMM-C 597 Thesis (3 cr.)** Applied communication students who choose the thesis option will identify a research topic and develop it under the guidance of the student's thesis director (IU Indianapolis professor). The thesis topic will be related to the field of applied communication in its foci and method.
 - **COMM-C 598 Internship (1-3 cr.)** This course integrates applied communication theory and practice in a practice setting. Students will apply theoretical concepts and research tools, conduct projects, and interact with communication professionals in the designated setting. In concert with the student's chosen area of concentration, he or she will address issues of importance to that particular organization.
 - **COMM-C 599 Independent Study (1-6 cr.)** This course provides students with the opportunity to synthesize and apply knowledge acquired through course work and professional experience into a completed research project in applied communication. Students will work independently on a topic/issue of choice under the guidance of graduate faculty.
 - **COMM-G 598 Communication Studies Thesis Research (0 cr.)** Master's students who have enrolled in 30 or more hours of graduate course work applicable to the degree and who have completed all other requirements of the degree except the thesis of the final project of performances may enroll in COMM G598. Requires section authorization.
 - **COMM-C 620 Computer-Mediated Communication (3 cr.)** An overview of practical and scholarly approaches to computer mediated communication. The readings address mass communication, discourse, community, gender, intercultural understanding, ethics, interpersonal relationships, identity, organizational communication, and education.
 - **COMM-C 621 Persuasion (3 cr.)** This course takes a rhetorical/critical approach to persuasion in its broadest sense, how it affects our lives everyday and how we can find evidence of persuasive tactics in unexpected places. We will look broadly at theories of persuasion and their application across contexts and fields.
 - **COMM-C 644 Political Communications (3 cr.)** This course will examine the public communication involved in various political contexts. We will consider the communication involved in political campaigns, advertising, and oratory; social media, technology, and popular culture; the news, framing, and political media; citizenship, public deliberation, and decision making in what some argue is a divided political culture. We will read and discuss state of the art research in political communication and meet individuals who are currently working in a communication capacity in public political campaigns.
 - **COMM-C 650 Health Communication Media (3 cr.)** Focus on the effect of media on health behavior. Theories of health behavior change and media effects examined; applications of theory to health campaigns evaluated. Examples of mediated health campaigns and effectiveness discussed.
- Considerations include: interplay among theory, research, practice; how theory informs practice; how research aids in theory construction/refinement.
- **COMM-C 680 Qualitative/Rhetorical Methods** Focuses on health-related issues and topics through the complementary lenses of rhetoric and social sciences in communication. Qualitative social science-based approaches to research share numerous assumptions with rhetoric. These but are not limited to: Research based on inductive reasoning; methods cannot be detached from the objects of the research; researchers cannot separate themselves from the research; research is at least as much an art as it is a science.
 - **COMM-C 690 Quantitative Research** in COMM Course focuses on the principles and theory of descriptive and inferential statistics within the context of health communication research. Topics include ttest, ANOVA, MANOVA, ANCOVA, correlation, multiple regression, and SEM. Students will gain proficiency using SPSS to analyze novel data sets and will conduct their own health communication research projects and report the results.
 - **COMM-C 695 Communication and Healthcare** This seminar offers an interface between learning from practicing providers and experts in medical care specialties and becoming enmeshed in health communication research. The course is structured so that the student gains insights from experts in the medical field while also gaining an overview of research issues through reading and engaging in health communication research.
 - **COMM-C 700 Fieldwork/Research (1-9 cr.)** This course is designed to allow PhD students to complete independent research projects prior to enrollment in the dissertation course. Students can enroll in 1-9 credit hours in any given semester, depending on the nature of the project. The fieldwork/research course is designed to focus the student's research interests and to serve as a spring-board for dissertation work. Students must have ample preparation in some theoretical area and in one or more research methods prior to registration for the course. The course will allow students to initiate or conduct a research study, including the collection and examination of data (broadly defined), to answer a question or to test a hypothesis related to communication theory. May be repeated for credit.
 - **COMM-C 810 Dissertation (1-24 cr.)**

Human Performance and Rehabilitation Sciences

School of Health & Human Sciences

Departmental Email: hprofadv@iu.edu

Departmental URL: [Kinesiology](#) and [Health Sciences](#)

Curriculum

Degrees Offered

Master of Science and Doctor of Philosophy

M.S. in Human Performance and Rehabilitation Sciences

The Master of Science in Human Performance and Rehabilitation Sciences (HPRS) prepares students to advance knowledge and practice in optimizing physical performance, recovery, and functional health across diverse populations. Designed for students seeking professional growth in clinical, research, and applied performance settings, the program integrates core training in physiology, biomechanics, rehabilitation theory, and research methods. Students pursue one of two tracks—Human Performance or Rehabilitation Sciences—supporting knowledge development in areas such as exercise physiology, neuromuscular control, performance analysis, or clinical rehabilitation systems. The curriculum emphasizes evidence-based practice, research literacy, and interdisciplinary collaboration, equipping graduates to translate scientific knowledge into improved health and performance outcomes. The non-thesis, 30-credit-hour program includes common core coursework, track-specific courses, and advisor-approved electives that support individual academic and professional goals. Graduates are prepared for roles in research, healthcare, clinical exercise, performance enhancement, and doctoral study.

The MS in Human Performance and Rehabilitation Sciences will be delivered primarily through in-person instruction, reflecting the hands-on, research-intensive nature of the program. Approximately 75% of coursework will be conducted face-to-face on campus, including laboratory, research, and experiential components. A limited portion (less than 25%) of the curriculum may be offered online to provide flexibility and accommodate specialized content or guest instruction.

Admission Requirements

To be eligible to apply for the Master of Science in Human Performance and Rehabilitation Sciences, students must meet the following requirements:

- Completed—or will complete—undergraduate bachelor's degree before the intended start term in the program. Bachelor's degrees should be in health sciences, exercise science, kinesiology, or a related field.
- Undergraduate GPA of 3.0 or higher (on a 4.0 scale).
- GRE scores are recommended as one component to strengthen the prospective student's application.

Application requirements

- Three letters of recommendation
- Personal statement that addresses the student's professional experiences, personal goals, and career aspirations plus how earning a master's degree relates to each.
- Official transcripts from all universities and colleges attended.

Grades

Students must maintain an academic average of at least 3.0 (B) on a 4.0 scale.

Program Learning Outcomes

Common Learning Outcomes

- Apply advanced concepts in human physiology, biomechanics, and rehabilitation to real-world contexts.
- Interpret and critically evaluate scientific literature in human performance and rehabilitation.
- Design and assess evidence-based interventions that improve functional and performance outcomes.
- Utilize research and data analysis methods to support clinical or performance decision-making.
- Communicate scientific and professional information effectively to diverse audiences.

Human Performance Track Learning Outcomes

- Demonstrate advanced understanding of neuromuscular and cardiovascular physiology as related to exercise performance.
- Integrate mechanical and biomechanical principles in performance evaluation.
- Develop performance optimization strategies using advanced training and movement theories.

Rehabilitation Sciences Track Learning Outcomes

- Analyze and apply rehabilitation theories in health systems contexts.
- Evaluate rehabilitation system delivery models and health outcomes.
- Demonstrate professional competence in applied research in rehabilitation sciences.
- Design and execute small-scale research or evidence-based practice projects.

Interdisciplinary Learning Outcomes

- Deepen knowledge in specialized domains (e.g., biostatistics, informatics, exercise physiology).

Program Requirements

Curriculum (30 credits total)

Common Core Courses (15 credit hours)

All students share a common core sequence which establishes a consistent base in research literacy, ethics, and evidence-based practice.

- HLSC-H 660 Health & Human Sciences Foundations: Scientific Thought and Theory Building (3 credit hours)
- KINE-T 590 Research Methods in Health and Human Sciences (3 credit hours)
- KINE-T 591 Applied Statistics in Health and Human Sciences (3 credit hours)
- KINE-K 701 Scientific Writing in Health and Human Sciences (3 credit hours)
- GRDM-G-504 Introduction to Research Ethics (3 credit hours)

Track-Specific Coursework (9-12 credit hours)

Human Performance Track (12 credits) – Integrates key kinesiology coursework, building on evidence-based methods to enhance physical and athletic performance.

- KINE-K 530 Mechanical Analysis of Human Performance (3 credit hours)
- HPER-K 533 Advanced Theories of High-Level Performance (3 credit hours)

- KINE-K 635 Cardiovascular Physiology of Exercise (3 credit hours)
- KINE-K 542 Neuromuscular Control of Human Movement (3 credit hours)

Rehabilitation Sciences Track (9 credits) – Incorporates foundational courses from the Health Sciences program, emphasizing rehabilitation theory, clinical systems, and applied research.

- HLSC-H 661 Theory Application in Health & Rehabilitation Sciences (3 credit hours)
- HLSC-H 662 Health & Rehabilitation Systems Delivery (3 credit hours)
- HLSC-H 670 Research Practicum in Health & Rehabilitation Sciences (3 credit hours)

Graduate Electives (advisor-approved) (3-6 credit hours)

Students complete 3 (Human Performance track) or 6 (Rehabilitation track) credit hours, of graduate-level electives selected under the guidance and approval of their academic advisor. Electives should support the student's professional focus or research interests in areas such as:

- Biostatistics
- Clinical Research Methods
- Health Informatics
- Exercise Physiology
- Human Anatomy and Physiology
- Data Analysis in Health Sciences

Note: Electives must be graduate-level (500 or above) and approved by the program advisor.

Program Completion Requirements

- Students complete coursework only; no thesis or capstone is required.
- Comprehensive Evaluation: Students must demonstrate mastery of program outcomes through coursework, presentations, or portfolio review as determined by the program director.
- A minimum GPA of 3.0 is required for graduation.

Ph.D. in Human Performance and Rehabilitation Sciences

Through the Ph.D. in Human Performance and Rehabilitation Sciences, students will engage in an integrated curriculum that spans the full spectrum of human movement, performance enhancement, clinical rehabilitation, and functional restoration. The program will leverage the combined strengths of both disciplines—bridging high-performance research, applied exercise science, therapeutic rehabilitation, and health restoration—to better prepare graduates for leadership roles in academia, research institutes, clinical practice, and industry settings. Graduates of this program will be prepared to enter high-level careers in research, teaching, policy, and practice that span performance science (e.g., exercise physiology, biomechanics, human movement), rehabilitation science (e.g., disability, functional outcomes, systems of care), and translational work between those fields.

The PhD in Human Performance and Rehabilitation Sciences will be delivered primarily through in-person

instruction, reflecting the hands-on, research-intensive nature of the program. Approximately 75% of coursework will be conducted face-to-face on campus, including laboratory, research, and experiential components. A limited portion (less than 25%) of the curriculum may be offered online to provide flexibility and accommodate specialized content or guest instruction.

During the program, students will be required to pass qualifying exams, defend a dissertation proposal, then research, write, and defend a final dissertation.

Students should plan to complete coursework, pass exams, and defend their dissertation proposal within three years (post-master's degree) or five years (post-bachelor's degree) of full-time enrollment.

Admission Requirements

To be eligible for admission to the Ph.D. in Human Performance and Rehabilitation Sciences at IU Indianapolis, you need to meet the following requirements:

- Bachelor's degree from a regionally accredited institution
- Minimum grade point average of 3.0 (B) overall from undergraduate studies
- Applicants must maintain a GPA of at least 3.25/4.0 for the final 60 semester hours of undergraduate study, and 3.2/4.0 for all previous graduate work to be considered
- Submission of the [online application](#) to the campus
- A master's in health sciences, kinesiology, or related field, or directly after completing undergraduate study in health sciences, exercise science, kinesiology, or related field. Conditional admittance is considered if a student is applying from a different professional background. Students in this position are encouraged to reach out to an admissions professional at hprofadv@iu.edu, to explore their options.
- GRE scores are recommended as one component to strengthen the prospective student's application.
- Three letters of recommendation from professionals familiar with the applicant's academic or professional background.
- Personal statement, 300–500 words, to include: your preparation for research (examples include coursework in research, engagement in research projects or grants, etc.); intended research focus; learning objectives; leadership potential; and identified research mentor.
- Sample of student's own scientific writing from a published or unpublished work ready to share.
- Unofficial transcripts may be submitted for admissions review purposes. However, official transcripts showing degree conferral and documenting all undergraduate and graduate coursework will be required. Students who have not submitted all required official transcripts by the end of their first semester will have a registration hold placed on their account until the documents are received.
- Interview with a graduate faculty member involved in admission. Students must also identify a graduate faculty member who will allow the student to

research with them; research must be congruent with that faculty member. [Find research mentors](#)

- Non-native English speakers may be required to provide proof of English Proficiency as reflected on the [Graduate School's Testing Website](#).

Grades

Students must maintain an academic average of at least 3.0 (B) on a 4.0 scale.

Program Learning Outcomes

1. Demonstrate advanced competency in designing, conducting, analyzing, and disseminating original research that contributes new knowledge to the field.
2. Critically evaluate literature and theoretical frameworks to identify knowledge gaps and formulate meaningful research questions.
3. Employ advanced research methodologies, statistical analyses, and ethical standards in the design and execution of research.
4. Communicate research effectively through scholarly writing and oral presentations.
5. Integrate interdisciplinary perspectives to address complex health and performance problems.
6. Demonstrate leadership, mentorship, and teaching skills for academic or professional roles.
7. Exhibit ethical conduct and professional integrity in all aspects of research, teaching, and practice.

Health & Rehabilitation Track Learning Outcomes

1. Demonstrate comprehensive understanding and application of theories in health and rehabilitation sciences.
2. Analyze and evaluate health and rehabilitation systems to enhance quality and patient outcomes.
3. Design and conduct interdisciplinary research addressing rehabilitation challenges.
4. Translate scientific evidence into clinical or community-based rehabilitation practices.
5. Demonstrate effective teaching, mentorship, and leadership within academic or clinical contexts.

Human Performance Track Learning Outcomes

1. Apply biomechanical, neuromuscular, and physiological principles to analyze and enhance human performance.
2. Develop innovative methodologies and technologies for performance analysis and enhancement.
3. Utilize advanced statistical and experimental design techniques for performance data interpretation.
4. Translate research findings into evidence-based training, rehabilitation, and performance strategies.
5. Communicate complex scientific findings effectively to academic, clinical, and general audiences.

Curriculum

Credit Hours: 90 credit hours of graduate study will be required for the doctoral degree.

The 90 credit hours, required of all students, beyond a bachelor's will consist of:

- 15 credit hours of common core courses

- 12 credit hours of track-specific coursework
- 6 credit hours of qualifying exam preparation or lab research
- 9 hours in an outside minor
- 1-19 credit hours of SHHS research seminar
- 18-44 credit hours for dissertation work

A plan for these courses will be formulated and approved in consultation with Graduate Coordinator and faculty advisor.

Common Core Courses (15 credit hours)

All students share a common core sequence which establishes a consistent base in research literacy, ethics, and evidence-based practice.

- HLSC-H 660 Health & Human Sciences Foundations: Scientific Thought and Theory Building (3 credit hours)
- KINE-T 590 Research Methods in Health and Human Sciences (3 credit hours)
- KINE-T 591 Applied Statistics in Health and Human Sciences (3 credit hours)
- KINE-K 701 Scientific Writing in Health and Human Sciences (3 credit hours)
- GRDM-G-504 Introduction to Research Ethics (3 credit hours)

Track-Specific Coursework

Rehabilitation Sciences Track (12 Credit Hours)

- HLSC-H 661: Theory Application in Health & Rehabilitation Sciences (3 credit hours)
- HLSC-H 662: Health & Rehabilitation Systems Delivery (3 credit hours)
- HLSC-H 664: Professoriate for Health & Rehabilitation Sciences (3 credit hours)
- HLSC-H 670: Research Practicum in Health & Rehabilitation Sciences (3 credit hours)

Human Performance Track (12 Credit Hours)

- KINE-K 530: Mechanical Analysis of Human Performance (3 credit hours)
- HPER-K 533: Advanced Theories of High-Level Performance (3 credit hours)
- KINE-K 635: Cardiovascular Physiology of Exercise (3 credit hours)
- KINE-K 542: Neuromuscular Control of Human Movement (3 credit hours)

Qualifying Exam Preparation / Lab Research (6 Credit Hours)

Rehabilitation Sciences Track

- Directed electives, coordinated with advisor

Human Performance Track

- KINE-K 777 Qualifying Exam Preparation (6 cr)

Minor (9 hours):

Students must select a minor area outside their primary track (e.g., Public Health, Psychology, Informatics, Biostatistics, Education) or seek approval for an individualized minor.

All minor and related courses must be approved by the advisory committee as well as by the Graduate School in instances of individualized minors.

SHHS Research Seminar (1–19 Credit Hours)

- KINE-K 602: Research Seminar in Health, Kinesiology, and Exercise Science (1–5 cr per enrollment, up to 99 total)

PhD students will be expected to enroll in KINE-K602 each semester of matriculation.

Dissertation (18–45 Credit Hours)

Students will work with their advisor to take dissertation credits from the following:

- KINE-800: Dissertation Proposal in Kinesiology
- HLSC-H 690: Dissertation Proposal in Health & Rehabilitation Sciences
- HLSC-H 692: Dissertation in Health & Rehabilitation Sciences

GRAD-G 901 may be taken after 90 credit hours (6 credit hours per enrollment, up to 6 semesters maximum).

Summary of Program Requirements

Didactic Coursework: 36 credit hours

Research Training / Dissertation: 54 credit hours

*Full-time students in both tracks will typically qualify and begin the dissertation process by the start of their third year, allowing two years focused on dissertation research.
*

Advisory Committees:

Upon entry into the Ph.D. program, each student will form an Academic Advisory Committee. The role of the Academic Advisory Committee is to advise and approve the student's Plan of Study (POS). This committee must comprise a minimum of three graduate faculty from the School of Health and Human Sciences and a faculty member from the student's chosen minor subject area. The committee serves in an advisory capacity until the student passes the Qualifying Examination and forms his or her Doctoral Advisory Committee.

After successful completion of the Qualifying Examination, the student will solicit faculty members to serve on their Doctoral Advisory Committee (DAC). The DAC consists of at least four members whose duties will be to advise the student during their final course of study through to their dissertation defense. The student's Major Professor serves as the chair of the DAC.

The selection of the Major Professor requires their consent and the approval of the Graduate Coordinator. The student's research interests should align with the Major Professor's specialties. The DAC will comprise the student's Major Professor, two additional graduate faculty from the School of Health and Human Sciences, and one faculty member representing the student's minor area. Additional members may be included at the student's request. Inclusion of individuals without graduate faculty standing may be included but cannot supplant the other four members with graduate faculty status.

Examination Requirements:

Students must pass the three major examinations during the course of a Ph.D. program: the Qualifying Examination (QE), the Proposal Examination, and the Defense Examination. The purpose of the QE is to verify that students have mastered fundamental area-related topics in the student's concentration and minor areas at the core course level, and to present an oral examination of a topic in the concentration area. The purpose of the Proposal Examination is to determine whether a student is adequately prepared to conceive and undertake a suitable research topic. The Proposal Examination typically includes an oral presentation and a written thesis proposal. The purpose of the oral Defense

Examination of the dissertation is to determine if the thesis research warrants granting the Ph.D. degree. Doctoral research must be original and merit publication in scholarly literature.

Qualifying Examination:

Ph.D. candidates will be required to complete a comprehensive knowledge examination following completion of core coursework, and at least two terms before the final examination. The student's graduate committee, in consultation with the graduate student, will determine the timing of this examination and its content. The format and content for the exam is at the discretion of the student's advisory committee and will vary from student to student. The exam will have written and oral components. The written exam will be completed first and submitted to and graded satisfactory/not satisfactory by each committee member. The results of the written exam must be satisfactory to the committee before moving to the oral portion of the exam. No later than two weeks after the completion of the written exam, the student will undertake an oral defense of their exam. Students who fail to successfully complete the written or oral component of the comprehensive exam will, at the discretion of the student's graduate committee, be given no more than one attempt to retake the examination. A Ph.D. candidate must successfully pass the preliminary exam before being eligible for further progress in the program.

Requirements for Doctoral Candidacy

Candidates for the Ph.D. in Human Performance and Rehabilitative Science shall demonstrate the following (through successfully completing the QE) as a prerequisite to qualifying for the degree:

1. Intellectual awareness and curiosity sufficient to predict continued growth and contribution to the discipline.
2. Significant advanced, in-depth understanding in the fields of human performance or rehabilitative sciences.
3. Knowledge of representative literature and historical precedence of human performance or rehabilitative sciences.
4. Considerable depth of knowledge in some aspect of human performance or rehabilitative sciences.
5. Sufficient writing and speaking skills to communicate clearly and effectively to members of the scholarly community and the wider community, and especially in teaching situations.

6. Research skills appropriate to the student's specific focus within human performance or rehabilitative sciences, including expertise with appropriate methodologies, analysis, and statistics tools.

Proposal Examination:

The Proposal Examination is given to determine whether a student is adequately prepared to conceive and undertake a suitable research topic in the student's concentration and minor areas. Students may not schedule their Proposal Examination until after they have passed the Qualifying Examination and submitted their final Plan of Study. The Proposal Examination is primarily an oral examination associated with a written dissertation proposal but may include a written exam component at the discretion of the Doctoral Advisory Committee. Students must complete the Proposal Examination at least two academic sessions (counting regular semesters and summer sessions), for which they are registered, before taking the Defense Examination. The written dissertation proposal should be submitted to members of the Doctoral Advisory Committee at least two weeks before the examination.

During the Proposal Examination, the student is expected to exhibit:

- A clear understanding of the research problem;
- An awareness of pertinent background literature and current efforts in the research area of interest;
- Some initial progress toward solving the research problem; and
- A plan to execute the remainder of the dissertation research.

Only two attempts to pass this examination will be allowed.

Defense Examination:

A written narrative of original research must be approved by the Doctoral Advisory Committee in a public defense as described in the Graduate School Bulletin. Students enroll in KINE-K 799 PhD Dissertation each semester after the dissertation topic is approved until the research has been completed.

Time Limit for Completion of the Ph.D. Degree:

Students entering the Ph.D. program with a master's degree are to complete all degree requirements within five equivalent full-time years from the beginning of their first semester registration. Those entering the program with a bachelor's degree have seven years to complete their degree requirements.

Extension to the cited time limit may be requested in writing and approved at the recommendation of the student's Doctoral Advisory Committee and the Graduate Coordinator. Only full semesters count toward the time limit. A student who is not in good standing with regard to the cited time limit will not be allowed to register for the following semester without the approval of the Graduate Coordinator.

Courses

Courses Descriptions

- **GRDM-G-504 Introduction to Research Ethics (3 credit hours):** Introduction to the basic concepts of research ethics. The course will cover the historical development of concern with ethics in science as well as practical information needed by students working in science today. Format will be lecture and discussion.
- **HLSC-H 660 Health & Human Sciences Foundations: Scientific Thought and Theory Building (3 credit hours):** This course explores the foundations of health and human sciences through examination of the basis for and basics of scientific and critical thinking, theory building, and assessment in applied disciplines, evolution of disability, rehabilitation populations, intervention development, function assessment, evidence-based practice, and practice-based evidence.
- **HLSC-H 661 Theory Application in Health & Rehabilitation Sciences (3 credit hours):** This course will familiarize students with seminal and emerging health and rehabilitation related theories including those pertaining to disability, aging, health promotion and behavior, nursing, human development, goal setting, and motivation. Students will assess relationships between research, theory, practice, and intervention application, measurement, and assessment to health and rehabilitation professions.
- **HLSC-H 662 Health & Rehabilitation Systems Delivery (3 credit hours):** This course analyses emerging trends in health care systems and delivery associated with rehabilitation. Areas to be covered include organizational infrastructures, finance, public policy, and implications for disparate patient populations.
- **HLSC-H 664 Professoriate for Health & Rehabilitation Sciences (3 credit hours):** This course explores the professoriate for health and rehabilitation professionals through the framework of academic promotion and tenure. Discussion and assignments will have practical application and cover university systems and structure, assessment and accreditation, and the search, acquisition, and responsibilities (teaching, research, and service) of employment within the professoriate.
- **HLSC-H 690 Dissertation Proposal in Health & Rehabilitation Sciences (3-9 credit hours):** Students will submit a written proposal for original scholarly work that makes a significant contribution to research in the field of health and rehabilitation sciences. Proposal to include introduction to topic, literature review, and indication of methodology. This course may be taken more than once.
- **HLSC-H 692 Dissertation in Health & Rehabilitation Sciences (3-9 credit hours):** Original scholarly dissertation that makes a significant contribution to the field of health and rehabilitation sciences. Topic to be selected by the student and his/her Research Committee.
- **HLSC-H 670 Research Practicum in Health & Rehabilitation Sciences (3 credit hours):** Instructional orientation to research; includes

laboratory experience in the student's concentration area.

- **KINE-K 530 Mechanical Analysis of Human Performance (3 credit hours):** Newtonian mechanics applied to human movement. Analysis of sports techniques.
- **HPER-K 533 Advanced Theories of High-Level Performance (3 credit hours):** An integrative analysis of the physiological, psychological and biomechanical principles, mechanisms and phenomena underlying the acquisition of the capacities and abilities required for high-level physical performance.
- **KINE-K 542 Neuromuscular Control of Human Movement (3 credit hours):** An overview of neural mechanisms underlying motor control. Includes applications of neurophysiological principles to human motor performance.
- **KINE-T 590 Research Methods in Health and Human Sciences (3 credit hours):** This course introduces graduate students to the foundations of research in health and human sciences, emphasizing quantitative and qualitative methods, critical evaluation, and the development of skills for reading, conducting, and understanding research as a basis for advanced study and knowledge generation.
- **KINE-T 591 Applied Statistics in Health and Human Sciences (3 credit hours):** An applied approach to the collection, organization, analyses and interpretation of data pertinent to health and human sciences.
- **KINE-K 602 Research Seminar in Health, Kinesiology, and Exercise Science (1–5 credit hours per enrollment, up to 99 total):** Independent research conducted under the guidance of a graduate faculty member.
- **KINE-K 635 Cardiovascular Physiology of Exercise (3 credit hours):** Advanced principles of cardiovascular physiology with an emphasis on the regulatory mechanisms controlling cardiovascular function at rest and during physical stress.
- **KINE-K 701 Scientific Writing in Health and Human Sciences (3 credit hours):** This course will focus on scientific writing for the health and human sciences. The goal is to provide a broad writing foundation that students will be able to use towards future research. An emphasis will be on writing for manuscript publications and grants.
- **KINE-K 777 Qualifying Exam Preparation (6 credit hours):** This course will focus on the design and writing of the student's review for their qualifying examination. Additionally, by the end of the course session, each student will have established a qualifying examination date along with collaborating with their advisory committee to identify a specific topic area.
- **KINE-800 Dissertation Proposal in Kinesiology (3 credits):** This course will focus on the design and conduct of research to complete the aims identified in the student's research proposal. Successful completion of these aims are expected to lead to a written dissertation and a public presentation and defense.

Health Systems and Services Research

Richard M. Fairbanks School of Public Health

Program email: fsphinfo@iu.edu

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctors/minors/health-systems

Doctoral Minor in Health Systems and Services Research

This minor provides a mix of substantive and methods courses in social science or related reference disciplines that are frequently drawn on by researchers who study health systems or health services.

The purpose of this minor is to provide PhD students with a new minor option that helps them develop conceptual and methodological depth in social science or related reference disciplines that are frequently drawn on by researchers who study health systems or health services, including economics, psychology, sociology, biostatistics, and communication studies.

Because these areas of study often employ related concepts and methods, this minor will allow students to take minor courses that cut across departments and programs while still provide depth in a non-major area of study.

Curriculum

Students will complete 12 credits by choosing from the list of substantive and methods courses.

Students complete one or two of the following substantive courses:

Economics

- ECON-E 581 Applied Microeconomics I (3 cr)
- ECON-E 582 Applied Microeconomics II (3 cr)
- ECON-E 521 Microeconomics Theory (3 cr)
- ECON-E 583 Applied Macroeconomics (3 cr)

Psychology

- PSY-572 Organizational Psychology (3 cr)
- PSY-571 Staffing (3 cr)
- PSY-I 647 Attitudes and Social Cognition (3 cr)

Sociology

- SOC-R 515 Sociology of Health and Illness (3 cr)
- SOC-R 556 Advanced Sociological Theory I (3 cr)
- SOC-R 557 Advanced Sociological Theory II (3 cr)
- SOC-R 585 Social Aspects of Mental Health and Mental Illness (3 cr)
- SOC-R 560 Topics in Sociology (3 cr)

Communication Studies

- COMM-C 500 Advanced Communication Theory (3 cr)
- COMM-C 592 Advanced Health Communication (3 cr)
- COMM-C 528 Group Communication and Organizations (3 cr)

Students complete two or three of the following methods courses:

Econometric Methods

- ECON-E 570 Fundamentals of Statistics and Econometrics (3 cr)
- ECON-E 574 Applied Econometrics and Forecasting

Psychology Methods

- PSY-I 608 Measurement Theory and the Interpretation of Data (3 cr)
- PSY-I 643 Research Methods and Experimentation (3 cr)
- PSY-I 583 Judgment and Decision Making in Organizations

Biostatistics and Epidemiology Methods

- PBHL-B 552 Fundamentals of Data Management (3 cr)
- PBHL-B 571 Biostatistics Method I-Linear Model in Public Health (3 cr)
- PBHL-B 572 Biostatistics Method II-Categorical Data Analysis (3 cr)
- PBHL-B 573 Biostatistics Method III-Applied Survival Data Analysis (3 cr)
- PBHL-B 574 Biostatistics Method IV-Applied Longitudinal Data Analysis (3 cr)
- PBHL-B 581 Biostatistics Computing (3 cr)
- PBHL-B 582 Introduction to Clinical Trials (3 cr)
- PBHL-B 585 Analysis and Interpretation of Observational Studies (3 cr)
- PBHL-E 715 Design and Implementation of Observational Studies (3 cr)

Course Descriptions

- **PBHL-B 552 Fundamentals of Data Management (3 cr):** This course teaches concepts related to research data planning, collection, storage, processing, and dissemination. The curriculum includes theoretical guidelines and practical tools for conducting public health research. Hands-on training with real-world examples and problem-solving exercises in SAS will be used to ensure that students are comfortable with all concepts.
- **PBHL-B 571 Biostatistics Method I-Linear Model in Public Health (3 cr):** This course introduces statistical modeling techniques for continuous and categorical outcome data. Topics include ANOVA, Analysis of Covariance, and linear regression, with an emphasis on health sciences applications. Instruction integrates theoretical foundations with hands-on data analysis using SAS and R, enabling students to apply practical methods to biomedical research problems.
- **PBHL-B 572 Biostatistics Method II-Categorical Data Analysis (3 cr):** This course covers applied statistical methods for the analysis of categorical data with special emphasis on data collected from epidemiologic studies and general biomedical studies. The topics delivered in this course will focus on methods of categorical analysis commonly used in practice of the health sciences.
- **PBHL-B 573 Biostatistics Method III-Applied Survival Data Analysis (3 cr):** This course covers

the basic concepts of survival analysis, Kaplan-Meier curves, logrank test, Cox proportional hazard model, parametric survival models, and certain extensions. Expectations upon completion: for survival data, you should know which method to use, how to implement in software and how to interpret the results.

- **PBHL-B 574 Biostatistics Method IV-Applied Longitudinal Data Analysis (3 cr):** This course covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data, including the unbalanced and incomplete data frequently encountered in biomedical research. Class presentations and homework assignments will focus on data analysis in SAS using PROC GLM, PROC MIXED, PROC GENMOD, and PROC NLMIXED.
- **PBHL-B 581 Biostatistics Computing (3 cr):** This is a course teaching fundamental concepts of biostatistical computing, a broad set of skills required for data acquisition, processing and visualization. This course is oriented in programming in R, uses non-standard evaluation (NSE) techniques within the R language, and creates reproducible software in package form for the R language.
- **PBHL-B 582 Introduction to Clinical Trials (3 cr):** This is a standard course that prepares Biostatisticians for support of clinical trial projects. The course will cover fundamental aspects of the appropriate design and conduct of medical experiments involving human subjects (clinical research/trials) including ethics, design, sample size calculation, randomization, monitoring, data collection, analysis and reporting of the results.
- **PBHL-B 585 Analysis and Interpretation of Observational Studies (3 cr):** This course examines fundamental aspects of analyzing data generated by observational epidemiology studies. The focus is on developing a solid understanding of contemporary analytical techniques to increase the validity of the study and control for possible confounding factors and biases.
- **PBHL-E 715 Design and Implementation of Observational Studies (3 cr):** This course examines fundamental aspects of designing and implementing observational epidemiology studies. The focus is on developing strategies to increase the validity of the study results by using techniques to control for possible confounding factors and biases. Topics include sampling methods, sensitivity, data weighting, standardization, selection of cases and controls, matching, data collection and project management.
- **COMM-C 500 Advanced Communication Theory (3 cr):** Students explore how scholars from various traditions have described and explained the universal human experience of communication. Students develop an understanding of a variety of communication theories in order to more competently interpret events in more flexible, useful and discriminating ways.
- **COMM-C 592 Advanced Health Communication (3 cr):** A course designed to teach communication skills and practices related to health care, by examining health care communication theory. Topics covered range across communication levels

(interpersonal, intrapersonal, group, organizational, mass media & mediated communication) within a variety of health care contexts.

- **COMM-C 528 Group Communication and Organizations (3 cr):** This seminar-format course examines the ways in which informal groups and communication networks facilitate a variety of organizational processes (i.e. socialization, diffusion of innovation). Emphasis is placed on developing theoretical understanding of informal groups in organizations as well as on methodological issues involved in studying communication networks in organizations.
- **ECON-E 581 Applied Microeconomics I (3 cr):** This course is a graduate-level introduction to theoretical and empirical applications in two areas of microeconomics. We will demonstrate how economic concepts can be usefully applied to understanding problems in the sub-discipline under study and discuss and apply estimation techniques appropriate for problems in the area.
- **ECON-E 582 Applied Microeconomics II (3 cr):** This course is a second graduate-level introduction to theoretical and empirical applications in two areas of microeconomics. We will demonstrate how economic concepts can be usefully applied to understanding problems in the sub-discipline under study and discuss and apply estimation techniques appropriate for problems in the area.
- **ECON-E 521 Microeconomics Theory (3 cr):** Develops the methodology of economic analysis and teaches the tools and language of price theory. Fundamental elements of consumer theory, producer theory and economics of uncertainty. Emphasis on comparative statics and the duality theory. Topics on welfare analysis, the theory of price indices, quality of goods, revealed preferences, the theory of derived demand, expected utility theory, attitudes toward risk, and various measures of riskiness.
- **ECON-E 583 Applied Macroeconomics (3 cr):** This course is a graduate-level introduction to theoretical and empirical applications in two areas of microeconomics. We will demonstrate how economic concepts can be usefully applied to understanding problems in the sub-discipline under study and discuss and apply estimation and calibration techniques appropriate for problems in the area.
- **PSY-I 572 Organizational Psychology (3 cr):** A survey of basic behavioral science research and thinking as these contribute to the understanding of individual, dyadic, group, intergroup, and other large organization behavioral phenomena. The topics covered include motivation, perception, attitudes and morale, communication, leadership, conflict, problem solving, behavior change, and organizational effectiveness.
- **PSY-I 571 Staffing (3 cr):** This seminar course will introduce students to HR practices associated with bringing new members into organizations. Topics covered include recruitment, procedures for assessing the individual differences of applicants, models used to make selection decisions, and legal considerations associated with personnel selection (e.g., discrimination and affirmative action). The course will focus on theory and empirical research related primarily to the fields of industrial/organizational psychology and management.
- **PSY-I 647 Attitudes and Social Cognition (3 cr):** This graduate-level seminar provides an overview of contemporary social psychological theory and research, emphasizing the social-cognitive, affective, and motivational processes underlying attitudes, social inference, stereotyping, prejudice, and self-regulation. Class discussion will focus on the application of this research to promote prosocial and prevent antisocial behaviors affecting individuals, organizations, and society.
- **PSY-I 608 Measurement Theory and the Interpretation of Data (3 cr):** The theory of measurement and the development of reliability and the Spearman-Brown equations, true scores and variables, and correction for attenuation. Variance or covariance of combinations of variables. Item analysis and test construction strategies. Reliability and validity of measurements and the influence of measurement error and measurement threats to research design.
- **PSY-I 643 Research Methods and Experimentation (3 cr):** Covers methods appropriate for methods in psychology research. Topics will include experimental design, measurement, and ethics associated with research. Course will include the development of a research proposal.
- **PSY-I 583 Judgment and Decision Making in Organizations (3 cr):** This graduate seminar examines how decisions are made by individuals and groups in various organizational and institutional settings. Topics covered include how individuals process information, make judgments, and reach decisions; how groups reach decisions through interactive social processes; and how choices, decisions and plans are formulated by individuals and groups in selected real-world contexts (e.g., legal, medical, politics, sports, business, etc.). The course will rely heavily on theory and research in psychology, but also draw on the scholarly literature in related social science fields (e.g., sociology).
- **SOC-R 515 Sociology of Health and Illness (3 cr):** Surveys important areas of medical sociology, focusing on social factors influencing the distribution of disease, help-seeking and health care. Topics covered include social epidemiology, the health-care professions, socialization of providers, and issues of cost and cost containment.
- **SOC-R 556 Advanced Sociological Theory I (3 cr):** In-depth study of classical sociological theorists, particularly Marx, Durkheim, and Weber. Examines their roles in defining the discipline of sociology.
- **SOC-R 557 Advanced Sociological Theory II (3 cr):** In-depth study of contemporary sociological theories (e.g. conflict, structural functionalist, symbolic interactionist) as a continuation of the issues raised by the epistemological and social changes at the late twentieth century.
- **SOC-R 560 Topics in Sociology (3 cr)**

- **SOC-R 585 Social Aspects of Mental Health and Mental Illness (3 cr):** This is a graduate level course which focuses on the sociology of mental illness and mental health. Provides a thorough grounding in the research issues and traditions that have characterized scholarly inquiry into mental illness in the past. Students will become familiar with public policy as it has had an impact on the treatment of mental illness and on the mentally ill themselves.

History

School of Liberal Arts

Departmental email: history@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/history

Curriculum

Degrees Offered

Master of Arts in History, Doctoral Minor in History

Master of Arts in History

The M.A. program in History on the Indianapolis campus offers two areas of concentration: United States history and public history. United States history is a traditional area of concentration and will serve the needs of persons intending to pursue a doctoral program, those seeking a collateral degree to complement other fields such as education or library science, and individuals seeking personal fulfillment. Public history is designed to prepare persons interested in pursuing careers as historians in such settings as historical societies, museums, historic preservation organizations, historic parks, governmental agencies, and business corporations. With its proximity to a large number of such institutions, the Indianapolis campus is an ideal location at which to pursue a degree in public history.

Admission Requirements

1. Bachelor's degree and transcripts from all universities and colleges attended, with an overall undergraduate grade point average of at least 3.0 (B) and a minimum grade point average of 3.3 (B+) in the student's undergraduate major; an undergraduate major in history is not required, but applicants without such a background may be required to take additional coursework in history at the undergraduate level.
2. Personal statement
3. Three letters of recommendation
4. Writing sample
5. CV or resume
6. International applicants must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
7. The following deadlines must be observed in order to receive consideration for admission:

January 15 – priority fall admission

March 1 – summer and regular fall admission

October 15 – spring admission

Foreign Language

There is no foreign language requirement for the degree per se. However, those students who will incorporate foreign language documents in their graduate work will be expected to translate non-English sources. They must therefore demonstrate an appropriate level of competence in the relevant language before they begin work on their thesis. The Director of Graduate Studies and the student's thesis advisor may require the student to take additional coursework.

Students considering the possibility of going on for a Ph.D. should recognize that competence in at least one and sometimes two foreign languages is often a requirement in history doctoral programs.

Course Requirements

All coursework must follow the appropriate Plan of Study. Students pursuing any one of the three concentration areas must take HIST-H 501. With the consent of the Director of Graduate Studies, students may take as many as six (6) credits of electives. Elective options may be selected from History, Museum Studies, Library Information Science, and Anthropology. No grade below B– (2.7) will be counted toward a history master's degree. Students must maintain a program GPA of at least 3.0. For Transfer Credit information, see that section of the Graduate School Bulletin.

United States History MA requires the following 30 credit hours:

Core Courses (20 cr.)

HIST-H 501 Historical Methodology

HIST-H 505 Prof Development for Historians (1 cr.)

HIST-H 542 Introduction to Public History

HIST-H 565 Intro to Digital Public History

HIST-H 650 Colloquium in U.S. History

HIST-H 750 Seminar (3 cr.)

Thesis (4 cr.) - HIST-H 898 Thesis

Graduate History Courses (6 cr.) - A maximum 6 credit hours outside history with the approval of the Director of Graduate Studies

Public History MA (non-thesis) requires the following 30 credit hours:

Core Courses (20 cr.)

HIST-H 501 Historical Methodology

HIST-H 505 Prof Development for Historians (1 cr.)

HIST-H 542 Introduction to Public History

HIST-H 565 Intro to Digital Public History

HIST-H 650 Colloquium in U.S. History

HIST-H 750 Seminar (3 crs.)

Internships (4 cr. total) - HIST-H 543 (1-4 cr.)

- A maximum 6 credit hours outside history with the approval of the Director of Graduate Studies

Public History MA with thesis requires the following 32 credit hours:

Core Courses (20 cr.)

HIST-H 501 Historical Methodology

HIST-H 505 Prof Development for Historians (1 cr.)

HIST-H 542 Introduction to Public History

HIST-H 565 Intro to Digital Public History

HIST-H 650 Colloquium in U.S. History

HIST-H 750 Seminar (3 crs.)

Thesis (2 cr.) - HIST-H 898 Thesis

Internships (4 cr. total) - HIST-H 543 (1-4 cr.)

Electives (6 cr.) - A maximum 6 credit hours outside history with the approval of the Director of Graduate Studies

Doctoral Minor in History

Doctoral students in other departments or schools may minor in History by completing, with a grade point average no lower than B (3.0), at least 12 credit hours of graduate coursework in History. A minimum of six (6) credit hours must be taken on the Indianapolis campus. This coursework shall include:

Required Courses

- HIST-H 501 Historical Methodology
- A 600-level History Colloquium from the following:
 - HIST-H 615 Colloquium: Early Modern Western European History
 - HIST-H 620 Colloquium: Modern Western European History
 - HIST-H 630 Colloquium in British/British Imperial History
 - HIST-H 650 Colloquium in United States History
 - HIST-H 699 Colloquium in Comparative History
- A 700-level History Seminar from the following:
 - HIST-H 715 Seminar: Early Modern European History
 - HIST-H 720 Seminar: Modern Western European History
 - HIST-H 730 Seminar in British/British Imperial History
 - HIST-H 750 Seminar in U.S. History

Electives

- 3 additional graduate-level credit hours in History

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **HIST-H 500 History of Historical Thought (4 cr.)** Approaches to the historian's craft and reflections on history as a type of scholarly thinking. Recommended for new graduate students and others interested in history as a branch of knowledge.
- **HIST-H 501 Historical Methodology (4 cr.)** Discussion and application of the various methods and strategies used in historical research, toward the goal of developing a research design for the thesis.
- **HIST-H 509 Special Topics in European History (3 cr.)** Intensive study and analysis of special topics in history of Europe. Topics will vary from semester to semester. It may be repeated with different topics.
- **HIST-H 511 Special Topics in United States History (3 cr.)** Intensive study and analysis of selected topics in United States history. Topics will vary from semester to semester. It may be repeated with different topics.
- **HIST-H 516 History of Philanthropy in the United States (3 cr.)** Approaches philanthropy as a social relation between various groups and looks at issues ranging from the relation between government and the economy to African-American activism to women's roles. The course explores past and current debates about such issues to analyze the past, understand the present, and shape the future.
- **HIST-H 518 History of International Humanitarian Assistance (3 cr.)** This course covers the history of international humanitarian assistance during the nineteenth and twentieth centuries. Its focus is on the movements and activities that developed in wealthier countries (Europe and the U.S.) which attempted to help those in other lands in need of assistance (e.g., food, shelter, medical care), as a result of a variety of causes, both natural and man-made, such as famine, flood, epidemics, earthquakes, and volcanoes as well as wars and government oppression. The responses took many forms, governmental and nongovernmental, in a world that underwent very dramatic changes during the nineteenth and twentieth centuries.
- **HIST-H 521 Special Topics in African, Asian, or Latin American History (3 cr.)** Intensive study and analysis of selected topics in African, Asian, or Latin American history. Topics will vary from semester to semester, e.g., traditional Asia, modern Asia, Latin American intellectual history. It may be repeated with different topics.
- **HIST-H 542 Public History (4 cr.)** The application of history to public needs and public programs. Historic preservation, archival management, oral history, editing, public humanities programming, historical societies, etc.
- **HIST-H 543 Practicum in Public History (1-4 cr.)** Internships in public history programs, fieldwork, or research in the historical antecedents of contemporary problems. Students may enroll in HIST-H 543 only after having taken (or while taking) HIST-H 542.
- **HIST-H 546 History of Science, Medicine, and Technology (3 cr.)** Study of topics in the history of science, medicine, and technology. It may be

repeated (with different topics) with the permission of the Director of Graduate Studies.

- **HIST-H 547 Special Topics in Public History (3 cr.)** Intensive study and analysis of selected topics in public history. Topics will vary from semester to semester, e.g., to include historic preservation, material culture, archival practice, local & community history, and historical editing. It may be repeated with different topics.
- **HIST-H 548 Historical Administration (3 cr.)** This course presents an overview of issues faced by administrators and mid-level managers who work in museums, historical societies, archives, special collection libraries, and other cultural resource agencies. Topics, speakers, and readings are focused on issues that are unique to agencies that collect, preserve, and interpret historical resources.
- **HIST-H 575 Graduate Readings in History** (arr cr.)** A maximum of three (3) credits total of HIST-H 575 may be applied toward the M.A. in History.
- **HIST-T 500 Topics in History (1-3 cr.)** Intensive study and analysis of selected historical issues and problems of a limited scope from the perspective of social and historical studies. Topics will vary, but ordinarily cut across fields, regions, and periods. It may be repeated with different topics.
- **HIST-T 510 Historical Methodology (3 cr.)** An intensive, multi-media investigation of what artifacts comprise history and how historians devise various methods of inquiry driven by research questions to explain/interconnect those artifacts. Looks at surveys of current research methods/problems, especially in U.S. history, to illuminate the development of history as a rigorous discipline of inquiry.
- **HIST-T 520 Teaching College History (3 cr.)** This course prepares high-school teachers to teach college-level history. It contains three aspects: What to teach, how to teach, and how to assess both teaching and learning. The course will contain three aspects: content knowledge of history, the concept and skills of historical thinking, and development of an assessment plan.
- **HIST-T 530 Early America 1400 – 1800 (3 cr.)** This course explores the development of North America from 1400 to 1800. Special emphasis will be placed on encounters between natives of the continent and outsiders, the colonial experience, and the causes and consequences of the American Revolution.
- **HIST-T 531 European History (3 cr.)** This course covers European history and it will focus on major historical interpretations and debates of the events and turning points that shaped that history. Along with weekly online participation in response to readings, assignments will include short essays and reviews of assigned works.
- **HIST-T 540 The Long 19 Century 1800 – 1917 (3 cr.)** This course tracks U.S. history between the early nineteenth century and American participation in the First World War. Students will articulate their understanding of scholarly books, articles, and original records and will review two books, write short response papers, and craft a historiographical essay on a topic of their choosing.
- **HIST-T 541 Latin American History (3 cr.)** This course provides an introduction to Latin American history. Instructors may choose to provide a broad overview or use a theme as a lens with which to gain an understanding of Latin American history.
- **HIST-T 550 Modern United States, 1917 – present (3 cr.)** This course will focus on major historical interpretations and debates of the events and turning points that shaped the twentieth-century United States. Along with weekly online participation in response to readings, assignments will include short essays and reviews of assigned works.
- **HIST-T 551 Asian History (3 cr.)** This course covers the histories of China, Japan, and Korea in the late 19th and 20th centuries. It covers the modernization of the three countries, Japanese imperialism, World War II in Asia, Chinese and North Korean communist revolutions, and postwar economy, politics, and society in Japan, South Korea, and China.
- **HIST-T 560 The United State and the World: Comparative History (3 cr.)** History T560 considers themes from the American past connecting it to the wider world. If slavery, for example, is a principal element of our history, how does it compare with the history of other regions? To understand such topics, this course will examine studies in comparative and transnational history.
- **HIST-T 570 Introduction to Digital and Public History (3 cr.)** Offers a graduate-level introduction to digital and public history. This class will provide you with an introduction to the literature of the fields of digital and public history as well as key theoretical, methodological, and practical, issues and concepts.
- **HIST-T 571 World History (3 cr.)** This course provides an introduction to the field of World History. Instructors may choose to provide a broad overview or to use a theme as a lens with which to gain an understanding of world history.
- **HIST-T 590 Research Seminar in History (3 cr.)** This course serves an intensive historical research and writing seminar that seeks to provide graduate students with the structure and support develop a substantial piece of scholarship. Students will also develop and practice other scholarly skills such oral and written presentations and offering effective and collegial critiques of scholarship.
- **HIST-T 591 Research Seminar in Digital and Public History (3 cr.)** This course offers students the opportunity to develop their expertise in digital and public history. Students will be introduced to the theories and methods of digital and public history and will produce at least one research-based public or digital history project.

Colloquia

These courses are of seminar size and involve oral and written study of the problems, bibliographies, interpretations, and research trends in the fields with which they respectively deal. They are the chief means by which a student becomes knowledgeable in history at a professional level. Any of them may be taken more than once, upon approval of the Director of Graduate Studies.

- **HIST-H 615 Colloquium: Early Modern Western European History (4 cr.)**

- **HIST-H 620 Colloquium: Modern Western European History (4 cr.)**
- **HIST-H 630 Colloquium: British History (4 cr.)**
- **HIST-H 650 Colloquium: United States History (4 cr.)**
- **HIST-H 699 Colloquium: Comparative History (4 cr.)**

Seminars

These courses involve research at a mature level with primary sources in specialized topics and problems in the field with which they respectively deal. They train the student in historical scholarship. Any of them may be taken more than once, upon approval of the Director of Graduate Studies.

- **HIST-H 715 Seminar: Early Modern European History (4 cr.)**
- **HIST-H 720 Seminar: Modern Western European History (4 cr.)**
- **HIST-H 723 Seminar: British History (4 cr.)**
- **HIST-H 750 Seminar in United States History (4 cr.)**

Thesis

- **HIST-H 898 M.A. Thesis (1-6 cr.)**

Sports Journalism

Departmental E-mail: tcrews@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/departments/journalismPR

Curriculum

Degrees Offered

Master of Arts in Sports Journalism

Program Overview

The M.A. program in Sport Journalism program is intended to prepare students for work in the field, across a variety of media, corporations, organizations and institutions.

Admission Requirements

1. Bachelor's degree and transcripts from all colleges and universities attended, with an overall undergraduate GPA of at least 3.0
2. For applicants with an undergraduate GPA below 3.0, Graduate Record Examination (GRE) scores are required (applicants with a post-graduate degree are not required to submit GRE scores)
3. Three letters of recommendationA personal statement explaining how a master's degree will fit into the applicant's career goals
4. International students must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
5. The following deadlines must be observed in order to receive consideration for admission:

March 1 - for fall semester

October 15 - for spring semester

Grades

No grade below B- (2.7) will be counted toward these degrees.

Course Requirements

No grade below B- (2.7) will be counted toward this degree. Students must maintain a program GPA of at least 3.0.

Completion of 30 credit hours including:

- **JOUR-J 501 Public Affairs Reporting (3 cr.)**
- **JOUR-J 510 Media and Society Seminar (3 cr.)**
- **JOUR-J 540 Business of Sports Media (3 cr.)**
- **JOUR-J 541 Digital Sports Journalism (3 cr.)**
- **JOUR-J 542 Sports Journalism and Society (3 cr.)**
- **JOUR-J 543 Sports Law (3 cr.)**
- **JOUR-J 545 Sports Writing (3 cr.)**
- **JOUR-J 546 Sports Journalism Research (3 cr.)**
- **JOUR-J 547 Sports Broadcast Journalism (3 cr.)**
- **JOUR-J 620 Media Coverage of Sports (3 cr.)**

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **JOUR-J 501 Public Affairs Reporting (3 cr.)** This course includes lectures and roundtable discussion of problems in covering public affairs issues at the national, state, and local levels. Emphasis is on reporting on government, social welfare agencies, elections, political parties, special interest groups and other areas of general public interest.
- **JOUR-J 510 Media and Society Seminar (3 cr.)** This course offers an examination of structure, functions, ethics, and performance of communication and mass media, stressing a review of pertinent research literature. Students will analyze media policies and performance in light of communication theory and current economic, political and social thought.
- **JOUR-J 540 Business of Sports Media (3 cr.)** A history of how media have evolved from radio, network television and magazines into the multi-dimensional world of regional and national cable, the Internet, and the networks. The way media provide so much of the revenue for sports as an entertainment industry has made it the anchor for the sports industry.
- **JOUR-J 541 Digital Sports Journalism (3 cr.)** Students in this hands-on, practical course will learn how to envision, build, design and produce a sports website. Students will receive substantive training in the software used to produce web videos, podcasts and interactive graphics. And, students will be taught how to marry all of those elements into a compelling website.
- **JOUR-J 542 Sports Journalism and Society (3 cr.)** This course provides a broad understanding of how social issues impact sports and how sports impacts society. Included will be a historical overview of sports, athletes' rights, race and gender

in sports, the Olympics and international sports, youth sports, the commercialization of sports and the influence of the media on sports.

- **JOUR-J 543 Sports Law (3 cr.)** Students will develop a basic understanding of the relationship between sports and the law and of the basic concepts of major legal issues—antitrust, labor, contract and intellectual property—in sports today, while translating that knowledge into analytical reporting on those subjects.
- **JOUR-J 545 Sports Writing (3 cr.)** This course is an intensive, in-depth and practical instruction on reporting and writing for print, magazines and the Web. This course will include a broad range of sports writing, from long-form narrative for magazines to twittering on the Web. It also will explore the essentials of beat reporting, with experiential learning at live press conferences and events.
- **JOUR-J 546 Sports Journalism Research (3 cr.)** This course explores issues surrounding the highly lucrative nature of collegiate sports in America, such as which sports are the most and least profitable and the gap between men's and women's sports. Students will produce a research project in collaboration with a major media outlet.
- **JOUR-J 547 Sports Broadcast Journalism (3 cr.)** The course is an intensive, in-depth and practical instruction of sports broadcasting. This course will include instruction in everything from play-by-play broadcasting of live events to the art of interviewing for television to writing and editing long segments.
- **JOUR-J 620 Media Coverage of Sports (3 cr.)** This course will examine athletes, coaches, events and sports media coverage. It will focus on current events and controversies such as amateurism, competitive balance, debate over school mascots, gambling and problems in recruiting and the ensuing media coverage.

Other Journalism courses

- **JOUR-J 528 Public Relations Management (3 cr.)** The primary purpose of this course is to provide you with a fundamental knowledge of the organizational structures, management styles, and problems commonly encountered in the management public relations or advertising firms and the advertising and/or public relations departments in a corporation or government agency. It also examines management structures in not-for-profit organizations.
- **JOUR-J 529 Public Relations Campaigns (3 cr.)** This capstone course provides students with an opportunity to apply campaign model methodology to public relations planning so that they will be able to apply the research, theories, planning, and evaluation processes in working conditions which may not provide them with the time to deliberate on and evaluate each step in the way that the classroom provides.
- **JOUR-J 531 Public Relations for Non-Profits (3 cr.)** The course provides a theoretical and practical foundation in public relations for those considering careers in nonprofit organizations or in fundraising. Specific coursework will involve the public relations campaign process and its relationship

to organizational goals and to the specifics of organizational development and fundraising. An additional focus will involve the communications efforts required to maintain relationships with donors, volunteers and key community and industry officials.

- **JOUR-J 560 Topics Colloquium (3 cr.)** Topical seminar dealing with changing subjects and material from semester to semester.
- **JOUR-J 563 Computerized Publication Design (3 cr.)** This publishing design course incorporates typesetting, electronic photo editing, graphics, and page design. Students are instructed in design theory, computer publishing skills, and creative problem solving.
- **JOUR-J 804 Independent Study in Journalism (3 cr.)**

Life Sciences

School of Medicine

Department E-mail: biomed@iu.edu

Departmental URL: medicine.iu.edu/graduate-degrees/phd/indianapolis/curriculum

Curriculum

Courses

Degree Offered

Ph.D. Minor in Life Sciences

Minor Description

The doctoral minor Life Sciences is a 12 credit hour minor designed to provide Ph.D. students in the IUSM Graduate Division and any program throughout IU the opportunity to gain a breadth of fundamental understanding of biomedical and life sciences as applied toward interdisciplinary team science where the ability to communicate and work with team members from diverse training backgrounds is a key skill set to be developed.

Plan of Study

For Ph.D. programs within the I.U. School of Medicine, a life sciences minor may be selected by a student with the consent of the student's advisory committee. This minor requires a minimum of 12 credit hours of advanced graduate level courses taken outside of the student's major department. At least 6 credit hours must be in a single department/program. The minor representative on the advisory committee must be selected from one of the departments in which courses for the minor are taken and will ordinarily be from the department contributing two or more courses to the minor.

For students enrolled in the combined MD/PhD program only

Students enrolled in the combined MD/PhD program may select the following courses below to count towards the life sciences minor, instead of the above plan of study, unless they are also being used to fulfill requirements towards their PhD program. In that specific case, another GRDM-X course can be used in its place. Please note that these are graduate level versions of Phase 1 courses from the Doctor of Medicine curriculum:

- GRDM-X 630: Molecules to Cells and Tissues (8 cr.)

- GRDM-X 640: Fundamentals of Health and Disease (6 cr.)

The following courses taken by students admitted through the Indiana Biomedical Gateway (IBMG) Program for PhD Study **cannot** be applied to the Life Sciences minor if they are required by their PhD major plan of study:

- COMM-C 534: Distilling Your Message (1 cr.)
- COMM-C533: Improvisation for Scientists (1 cr.)
- ENG-W 533: Science Writing (1 cr.)
- GRDM-G 505: Responsible Conduct of Research (1 cr.)
- GRDM-G 506: Responsible Conduct of Translational Research (1 cr.)
- GRDM-G 507: Reagent Validation as a Means for Enhanced research Reproducibility (1 cr.)
- GRDM-G 702: Entering Biomedical Research (1 cr.)
- GRDM-G 855: Experimental Design and Biostatistics (1 cr.)

Admission Requirements

To be admitted to the Ph.D. minor in Life Sciences, you must be a currently enrolled doctoral student in good academic standing in any IU or IU Indianapolis school.

Grading Policy

A minimum of B (3.0) is required in each course that is to count toward the minor. If a minimum of B (3.0) is not earned in a course, that course must be retaken. A course may be retaken only once. Students who fail to achieve the minimum grade of B (3.0) the second time they take a course, will not be able to earn this Ph.D. minor.

Qualifying Exam

This Ph.D minor does not require a Qualifying Exam

Examples of Courses that could be selected for the Life Sciences Minor unless they are required for the PhD program major plan of study:

Graduate Medicine (GRDM)

- GRDM-G 700 – Translating Foundational Sciences to Contemp. Know. (1 cr.)
- GRDM-G 715 – Biomedical Sciences 1 (2 - 3 cr.)
- GRDM-G 716 – Biomedical Sciences 2 (2 -3 cr.)
- GRDM-G 717 – Biomedical Sciences 3 (2 - 3 cr.)
- GRDM-G 703 – Physiology of the Coronary Circulation (1 cr.)
- GRDM-G 707 – Physiology of Smooth Muscle (1 cr.)
- GRDM-G 708 – Cardiac and Coronary Physiology of Exercise (1 cr.)
- GRDM G 720 – Stem Cell Biology (2 cr.)
- GRDM-G 724 – Molecular Cancer Genetics (1 cr.)
- GRDM-G 725 – Gene Therapy (1 cr.)
- GRDM-G 727 – Animal Models of Human Disease (1 cr.)
- GRDM-G 728 – Fundamental Concepts of Infection and Immunity (1 cr.)
- GRDM-G 729 – Introduction to the Immune System (1 cr.)
- GRDM-G 745 – Fundamentals of Intracellular Signal Transduction (1 cr.)
- GRDM-G 747 – Principles of Pharmacology (1 cr.)

- GRDM-G 748 – Principles of Toxicology 1 (1 cr.)
- GRDM-G 751 – PHAR-G 751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr.)
- GRDM-G 761 – Molecular and Cellular Physiology of Ion Channels (1 cr.)
- GRDM-G 762 – Renal Physiology (1 cr.)
- GRDM-G 780 – Foundations of Neuroscience (6 cr.)
- GRDM-G 788 – Next Generation Sequencing (3 cr.)
- GRDM-G 817 – Molecular Basis of Cell Structure and Function (2 cr.)
- GRDM-G 805 – Diabetes and Obesity (2 cr.)
- GRDM-G 801 – Cell Biology of the Neuromusculoskeletal System (4 cr.)
- GRDM-G 819 – Basic Bone Biology (3 cr.)
- GRDM-G 807 – Structural and Chemical Biology (2 cr.)
- GRDM-G 826 – Heterologous Expression of Proteins and Small Molecules
- GRDM-G 848 – Bioinformatics, Genomics, Proteomics & Systems Biology (2 cr.)
- GRDM-G 852 – Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)

Anatomy and Cell Biology

- ANAT-D 501 Human Gross Anatomy (5 cr.)
- ANAT D 528 Gross Anatomy for Health Care Professionals (5 cr.)
- ANAT-D 502 Basic Histology (4 cr.)
- ANAT-D 527 Neuroanatomy: Contemporary and Translational (3 cr.)
- ANAT-D 701 Translational Neuroscience (5 cr.)

Cellular and Integrative Physiology

- PHSL-F 513 Human Physiology (6 cr.)
- PHSL-F 603 Integrated Medical Physiology (3 cr.)

Medical and Molecular Genetics (MGEN)

- MGEN-Q 580 – Basic Human Genetics (3 cr.)
- MGEN-Q 612 – Molecular and Biochemical Genetics (3 cr.)
- MGEN Q 613 – Molecular and Biochemical Genetics Lab (2 cr.)
- MGEN-Q 620 – Cytogenetics (2 cr.)
- MGEN-Q 630 – Population Genetics (1 cr.)
- MGEN-G 788 Design and Analysis on Next Generation Sequencing Experiments (3 cr.)

Medical Neuroscience

- MNEU-N 711 – Translational Neuroscience and Neurogenetics (2 cr.)
- MNEU-N 880 – Advanced Topics in Medical Neuroscience (1 cr. – titles vary)

Microbiology and Immunology (MICR)

- MICR-J 807 – Current Topics in Immunology (2 cr.)
- MICR-J 829 – Current Topics in the Molecular Genetics of Microorganisms (2 cr.)
- MICR-J 815 Current Topics in Viral Immunology

Pathology and Laboratory Medicine

- PATH-C 693 – General and Clinical Pathology (4 cr.)

Pharmacology and Toxicology

- PHAR-F 850 – Experimental Design and Grant Writing in Pharmacology and Toxicology (1 cr.)
- PHAR-F 818: Principles of Medical Pharmacology (3 cr.)
- PHAR-F 828 Principles of Pharmaceutical Toxicology in the 21st Century (2 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

ANAT-D 501 HUMAN GROSS ANATOMY (5 cr.):

Introduction to the concepts, terminology and basic structure of the human body. Prosection of the body will use a regional approach. Emphasis on providing fundamental knowledge of the structure/function of major organ systems, peripheral nervous system, and vascular supply to the trunk, head and neck, limbs and back.

ANAT-D 502 BASIC HISTOLOGY (4 cr.): Lecture and laboratory instruction on the microscopic structure of the basic tissues and organs of the body. Previous exposure to gross anatomy principles and dissection encouraged.

ANAT-D 527 Neuroanatomy: Contemporary and Translational (3 cr.): This is an introductory course in Neuro-anatomy designed to introduce graduate students to the concepts, terminology, and basic structure of Neuro-anatomy. Emphasis will be on providing a fundamental working knowledge of the structure and function of the central and peripheral nervous system.

ANAT-D 528 Gross Anatomy for Health Care Professionals (5 cr.):

This is an introductory course in human gross anatomy designed to introduce the principal concepts, basic structure and function of the human body. Students will have the opportunity to learn, through dissection and demonstration of human cadaveric specimens, clinical and functional correlates of human anatomy.

ANAT-D 701 TRANSLATIONAL NEUROSCIENCE (3 cr.):

This graduate course uses a multidisciplinary approach to integrate the basic with the clinical neurosciences in understanding the human nervous system and select neurological disorders. Particular emphasis will be placed on deficits of motor function resulting from injury or disease. The functional anatomy of the brain and spinal cord will be studied using histologic atlas cross-sections and neuroradiologic images. Working as interdisciplinary teams, doctoral students in the biomedical sciences and rehabilitation sciences will explore relevant clinical cases in team-based learning activities.

COMM-C 533 IMPROVISATION FOR SCIENTISTS:

Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 DISTILLING YOUR MESSAGE (1 cr.):

Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

ENG-W 533 SCIENCE WRITING (1 cr.):

With an emphasis on shorter forms of writing, students discover voices, messages, and forms appropriate for bringing scientific expertise to non-science readers. They practice processes of response, revision, and editing to shape presentations for various readers, contexts, and paths of publication.

GRDM-G 505 RESPONSIBLE CONDUCT OF Research (1 cr.):

An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 506 Responsible Conduct of Translational Research (1 cr.):

This course provides an introduction to the responsible conduct of research (RCR), which the NIH defines as follows, "the practice of scientific investigation with integrity. It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research." While RCR is required for all types of research, this course focuses on issues that arise in relation to clinical and translational research, mostly involving human subjects. Completion of this course fulfills the NIH requirements for instruction in RCR for trainees and students.

GRDM-G 507 Reagent Validation as a Means for Enhanced research Reproducibility (1 cr.):

"Reagent Validation as a Means for Enhanced Research Reproducibility" is designed to provide training for pre-doctoral students in the area of appropriate reagent utilization by focusing on biological variables, with particular attention to murine models, and on biological and chemical resources, with particular attention to cell line authentication, plasmid verification, and antibody utilization. This course will entail a traditional didactic lecture series accompanied by relevant whole-class practical exercises allowing students to implement basic methods of reagent verification.

GRDM-G 700 Translating Foundational Sciences to Contemporary Knowledge (1 cr.):

G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then through discussion of an assigned paper from the primary literature.

GRDM-G 702 ENTERING BIOMEDICAL RESEARCH (1 cr.):

This mentee training curriculum is designed for first year graduate students to get the most from their mentored research experience. Group activities, case studies and facilitated discussion, are used to cover topics and concepts organized to develop their research skills, interpersonal skills, psychosocial skills, professionalism skills, and group dynamic skills.

GRDM-G 703 PHYSIOLOGY-CORONARY

CIRCULATION (1 cr.): Advanced study of the physiology, pharmacology, and pathophysiology of the coronary circulation using contemporary methods is emphasized. Concepts of hemodynamics, vasomotor and local metabolic control are reinforced. Approach will be the use of current texts, selected reviews, original research papers, interactive discussion, and projects.

GRDM-G 707 PHYSIOLOGY OF SMOOTH MUSCLE

(1 cr.): Advanced study of the physiology of the smooth muscle tissues with focus on the normal physiology and pathophysiology of airway smooth muscle and the airways. Biochemical and physiologic mechanisms in the regulation of contraction, growth and phenotypic expression in smooth muscle tissues will be explored.

GRDM-G 708 CARDIAC & CORONARY PHYSIOLOGY OF EXERCISE (1 cr.):

Exercise stimulus, quantification of work, and in vivo responses and adaptations involved in cellular and molecular mechanisms of myocardial and coronary artery responses and adaptations to exercise.

GRDM-G 715 BIOMEDICAL SCIENCE I (2 - 3 cr.): One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G 716 BIOMEDICAL SCIENCE II (2 - 3 cr.):

Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G 717 BIOMEDICAL SCIENCE III (2 - 3 cr.):

Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G 720 STEM CELL BIOLOGY (2 cr.): This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external or external stimuli, and what their clinical capabilities are and might be.

GRDM-G 724 MOLECULAR CANCER GENETICS (1

cr.): An introduction to cancer focusing on genetics. Topics include causes and effects of chromosome instability (including centromere/telomere failures and chromosomal translocation), epigenetic changes and genetic risk factors during cancer progression.

GRDM-G 725 GENE TRANSFER APPROACHES (1 cr.):

A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus

on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.

GRDM-G 727 ANIMAL MODELS OF HUMAN DISEASE

(1 cr.): This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal of the course is to provide a framework for students to select experimental animal models in their future research careers.

GRDM-G 728 INFECTION AND PATHOGENESIS (1

cr.): This course will cover concepts of host-pathogen interactions ranging from pathogen entry, growth and spread in the host to pathogen and mediated injury, immune evasion, pathogen survival strategies and transmission to new hosts. Basics of bacterial, viral and parasitic structures will be considered as they relate to pathogenesis.

GRDM-G 729 IMMUNOLOGY I-INTR IMMUNE SYSTM

(1 cr.): An introductory biomedical science, lecture-based core course intended for all incoming basic science graduate doctoral students in the School of Medicine programs or other interested graduate students. The course will cover components of the immune system development of the immune system, the immune response to pathogens and immunological disease.

GRDM-G 740 TRNSL SYS PHYS PHARM: This course is designed to teach students the basics of physiological systems and therapeutics used to target those systems for the management of known human diseases.

GRDM-G 745 Fundamentals of Intracellular Signal

Transduction (1 cr.): Experimental basis for cellular and molecular concepts of intracellular signaling cascades activated by multiple processes. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide "facts" to memorize.

GRDM-G 747 PRINCIPLES OF PHARMACOLOGY (1

cr.): This course is intended for incoming, basic science doctoral graduate students in the School of Medicine Pharmacology & Toxicology programs of other interested graduate students. This course covers the basic of drug receptor interactions, drug metabolism, pharmacokinetics, and pharmacokinetics. This course will include PowerPoint presentations and student presentations.

GRDM-G 748 PRINCIPLES OF TOXICOLOGY 1 (1

cr.): This course will present the fundamental concepts of toxicology necessary to understand the effects of chemicals on human health. Cellular and molecular mechanisms involved in toxic responses elicited by pharmaceutical and environmental agents, activation and detoxification of drugs and chemicals, and the principles of carcinogenesis and mutagenesis will be presented.

GRDM-G 761 Molecular and Cellular Physiology of Ion Channels (1 cr.):

Advanced ion transport topics selected from current research on channels, pumps, and exchangers. Topics include transporter

biophysical characteristics, long-term regulation, and electrophysiological and optical methods for study.

GRDM-G 762 RENAL PHYSIOLOGY (1 cr.): Reading and discussion of classical papers in renal physiology. Laboratory experiences will include measurement of renal functions using clearance methods and demonstrations of micropuncture and in vivo techniques.

GRDM-G 780 FOUNDATIONS OF NEUROSCIENCE (6 cr.): This course provides an introduction to the nervous system and its disorders. The course will provide a broad-based introduction to the structure of the nervous system, its cellular composition and mechanisms through which neurons communicate and regulate behavior and cognition. The course incorporates an in-depth analysis of the current literature.

GRDM-G 788 INTRODUCTION TO NEXT GENERATION SEQUENCING (3 cr.): Understanding the basic principles of next generation sequencing technology. This includes basic biological applications, basics in data processing, statistical and informatics theories in data analysis, advantages, limitations, and assumption of different methodologies, and biological interpretation of the results.

GRDM-G 801 Cell Biology of the Neuromusculoskeletal System (4 cr.): The overall objective of this graduate course is to present, in an experimental context, information integrating cell structure with cell function. The specific focus is on topics in which new information on cell function has enhanced or reformulated our understanding of cell biology of the neuromusculoskeletal system.

GRDM-G 805 DIABETES AND OBESITY (2 cr.): Biochemistry, cell biology, molecular biology, genetics, immunology and pathophysiology of diabetes and obesity. Topics include metabolic regulation, signal transduction, insulin resistance, insulin production, beta-cell function, animal models, complications, nutrition, prevention and therapy.

GRDM-G 807 STRUCTURAL & CHEMICAL BIOLOGY (2 cr.): Fundamentals of structural and chemical biology focused on state-of-the art approaches to inhibitor discovery, use of inhibitor in elucidating biological function, and computational and structural approaches to rational inhibitor design.

GRDM-G 817 MOLECLR BASIS-CELL STRCT FNCTN: Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 819 BASIC BONE BIOLOGY (3 cr.): An introduction to basic bone biology, including bone morphology, composition and physiology; cell biology of bone cells; measurement techniques; adaptation to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development.

GRDM-G 826 SYNTH BIOLOGY AND BIOLOGICS: This course will explore synthetic biology approach by which the cell biological, molecular, and metabolic changes can be introduced into model systems to allow for both faithful

expression and high abundance of heterologous proteins as well as heterologous small molecules.

GRDM-G 848 Bioinformatics, Genomics, Proteomics & Systems Biology (2 cr.): Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which in turn have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G 852 CANCER SIGNALING GONE AWRY (2 cr.): Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G 855 Experimental Design and Biostatistics (1 cr.): This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

GRDM-X 630 MOLECULES TO CELLS AND TISSUES (8 cr.): The overarching goal of Molecules to Cells and Tissues (MCT) is to integrate the biochemistry, genetics, and cell and molecular biology underlying normal cell structure and function as it relates to disease pathogenesis.

GRDM-X 640 FUNDAMENTALS OF HEALTH & DISEASE (6 cr.): Students' knowledge of physiological, pathophysiological and pharmacological principles will enable them to describe maintenance of normal physiologic functions and discuss disease states and drug treatments in terms of altered cellular and tissue function.

MGEN-Q 580 BASIC HUMAN GENETICS (3 cr.): An introduction to the genetics of human traits and heritable diseases. Emphasis will be on general aspects of eukaryote genetics as it applies to humans, but some prokaryote genetics will be included for comparison.

MGEN-Q 612 MOLECULAR & BIOCHEM GENETICS (3 cr.): The molecular and biochemical aspects of gene function in a variety of genetic disorders are studied. Emphasis is on the DNA lesion when known, on aberrations in the metabolic pathways and on structural defects. Hemoglobinopathies, phenylketonuria, storage diseases and other conditions are discussed.

MGEN-Q 613 Molecular and Biochemical Genetics Lab (2 cr.): The student will learn to perform many of the molecular and biochemical techniques for the determination of genetic markers that can be used for diagnosis, genotyping and forensic applications.

MGEN-Q 620 HUMAN CYTOGENETICS (2 cr.): Study of chromosome structure and replication, X-inactivation, meiosis, numerical and structural rearrangements in man and cytogenetics of malignancies.

MGEN-Q 630 POPULATION GENETICS (1 cr.): Effects of mutation and selection on the survival of alleles in a population; consequences of consanguinity and inbreeding; methods of analysis including segregation and

linkage including nonparametric methods; quantitative genetics such as twin studies and heritability.

MICR-J 807 CURRENT TOPICS IN IMMUNOLOGY (2 cr.): Discussion and review of current literature in selected topics in immunology. Emphasis on molecular and cellular events in lymphocyte activation and regulation. Topic varies from year to year.

MICR-J 829 Current Topics in the Molecular Genetics of Microorganisms (2 cr.): In-depth study of a specific topic in contemporary molecular genetics of microorganisms. Topics varies.

MICR-J 842 NEOPLASTIC DETERMINANTS: Focus on the genetic basis of the cancer phenotype. Consider effects of DNA sequence mutations, chromosomal rearrangements, and/or introduction of new genetic information on DNA repair, oncogene products and tumor suppressors, Intra- and intercellular consequences of these discrete alterations will be included.

MNEU-N 711 TRANSLATIONAL NEUROSCIENCE (2 cr.): The purpose of this course is to familiarize students with advances in the understanding of the clinical features and pathogenesis of a wide range of neuro-degenerative diseases, including Alzheimer disease. The course will focus on all aspects of neuro-degenerative diseases including the underlying genetics, neuro-pathological, neuroimaging, clinical, and translational issues.

MNEU-N 880 Advanced Topics in Medical Neuroscience (1 cr. – titles vary): This advanced topics course will focus on research-specific areas of medical neuroscience to enhance the knowledge and skills of students. Examples of possible course themes include (but are not limited to): neuroimmunology; experimental methods and animal models for neuroscience disorders; neurobiology of nervous system injury and repair; addictions neuroscience; neurodegenerative disorders; pain disorders; neuroimaging; and neurobiology of psychiatric disorders.

PATH-C 693 GENERAL AND CLINICAL PATHOLOGY (4 cr.): Designed for Pathologists' Assistant students. Didactic and laboratory experiences introduce students to the basic concepts of pathologic processes and provide them with a working knowledge of clinical pathology testing, including chemistry, hematopathology, transfusion medicine, and microbiology.

PHAR-G 751 ADVANCED CONCEPTS IN CYTOSOLIC AND NUCLEAR SIGNAL TRANSDUCTION: This course is designed to give graduate students in biological sciences a state-of-the-art education in cellular signaling mechanisms and the methodology used to study them. Landmark and breaking scientific journal articles in various signaling fields will be discussed and critically evaluated. Emphasis is given to experimental design and results interpretation.

PHAR-F 818 Principles of Medical Pharmacology (3 cr.): This survey of pharmacology will teach the student general principles of drug action. Students will develop an understanding of the basic pharmacokinetic, pharmacodynamic, and pharmacogenetic principles underlying drug therapy; prototypic drugs and their adverse effects; the development of drug dependence and addiction; and an awareness of environmental toxins.

PHAR-F 828 Principles of Pharmaceutical Toxicology in the 21st Century (2 cr.): Using basic principles of toxicology and novel therapeutic-lead screening technologies, the understanding of pharmaceutical- or xenobiotic-induced target organ or system toxicology will be presented. Students will develop an understanding of the cellular and molecular mechanisms involved in toxic responses elicited by therapeutic leads and environmental agents, activation and detoxification mechanisms for chemicals, and principles of estimating human risk assessment from pharmaceutical or xenobiotic exposure. This course will largely be taught by industry experts in the pharmaceutical and biotechnology fields. This course is designed to provide a foundation for understanding the complex interactions between toxicants/pharmaceutical leads and biological systems from an industry approach.

PHAR-F 850 Experimental Design and Grant Writing in Pharmacology and Toxicology (1 cr.): Will prepare students for the preparation of an "NIH style" grant proposal, such as that used for NRSA predoctoral fellowship grant. Students will learn how to formulate and present hypotheses, specific aims, and research plans. Students will develop a mini grant proposal and participate in a mock study section.

PHSL-F 513 HUMAN PHYSIOLOGY (6 cr.): Individual work on a research problem.

PHSL-F 603 INTEGRATED MEDICAL PHYSIOLOGY (3 cr.): This course will provide students and fellows with the opportunity to extend their knowledge of human physiology by investigating the mechanisms of human diseases and understanding how physiological systems interact in order to maintain homeostasis in health and disease. This course will build upon the physiological principles students have learned in F503, Human Physiology. A combination of lectures and team based learning will be integrated with discussion of articles from the primary literature to develop the students understanding of how diseases affect the integrated physiology of humans.

Math Science

Department of Mathematical Sciences

Science Building, LD 270, 402 N. Blackford Street, Indianapolis, IN 46202-3216

Phone: (317) 274-6918; fax: (317) 274-3460

Department URL: science.indianapolis.iu.edu/math

Department Chair: Jeffrey X. Watt, Ph.D.

Department Associate Chair: Daniel Ramras, Ph.D.

Graduate Director: Roland Roeder, Ph.D.

M.S. Program Director: Julia Arciero, Ph.D.

Graduate Advisor: Lisa Hastings-Smith, M.A.

Curriculum

Courses

Degrees Offered

- Master of Science (M.S.) in Mathematical Sciences (Pure Math, Applied Math, Math Education, or Applied Statistics Tracks) - Non-Thesis or Thesis Option
- Master of Science (M.S.) in Computational Data Science
- Doctor of Philosophy (Ph.D.) in Mathematical Sciences

- Algebra and Discrete Math Ph.D. Minor
- Computational Data Science Minor (12 credits)
- Geometry and Topology Ph.D. Minor
- Mathematical Analysis Ph.D. Minor
- Mathematical Sciences Ph.D. Minor
- Statistics Ph.D. Minor
- Applied Statistics Ph.D. Minor (12 credits)

Program Descriptions

The Department of Mathematical Sciences offers a variety of graduate programs. Students can pursue an Indiana University Ph.D. in Mathematical Sciences with tracks in pure mathematics, applied mathematics, or statistics. The Department, in cooperation with the Department of Biostatistics in the IU School of Medicine and the IU Fairbanks School of Public Health, also administers an Indiana University Ph.D. in Biostatistics (all requirements completed on the IU Indianapolis campus). At the master's level, the department offers the Master of Science (M.S.) in Mathematical Sciences, with tracks in Pure Mathematics, Applied Mathematics, Mathematics Education, and Applied Statistics, as well as the Master of Science (M.S.) in Computational Data Science (an interdisciplinary program combining Computer Science and Statistics). The M.S. degree typically requires two years of full-time study, and the Ph.D. degree usually requires an additional two to three years beyond the master's degree.

Master of Science in Computational Data Science

Program Description

The objective of the M.S. in Computational Data Science program is to prepare students for careers in the rapidly growing field of data science. The program provides a solid, comprehensive background in relevant theory and its applications, integrating concepts from computer science and statistics. Data Science involves data-driven knowledge discovery, in terms of pattern analysis and prediction. Students study statistics, regression, Bayesian analysis, sequence analysis, machine learning, data mining, and data analysis. Data Science also incorporates methods for processing and analyzing specific kinds of data, such as text or image/video. This degree is a total of 30 hours with an expected duration of 1.5 - 2 years.

Admissions Requirements

- **Application Deadlines (Fall Semester) – March 1** for international applicants; **May 1** for domestic applicants. *(Note: Due to sequencing of course offerings, it may not be feasible to begin some programs in the Spring semester. Interested applicants should inquire with the department before applying for Spring admission.)*
- **Prerequisite degree:** 4-year bachelor's degree (or equivalent) in Computer Science, Engineering, Mathematics, Statistics or related fields. A 4-year bachelor's degree in any other area of study will be considered on a case-by-case basis, based on the coursework and corresponding grades in the applicant's transcripts, as well as on the Graduate Committee's assessment of the applicant's potential for successfully completing this program.

- **Prerequisite coursework:** Calculus sequence (including multivariate), linear algebra, introductory statistics, introductory probability, and data structures. An applicant can be admitted to the CDS M.S. program if they are missing at most two of the expected prerequisite courses (data structures, probability, statistics, or linear algebra). In this case, they are expected to complete the missing courses within the first year as described [here](#).
- **GPA Requirement:** 0
- **Graduate Record Examination (GRE) General Test:** Not required
- **Letters of Recommendation:** Three letters of recommendation should be submitted through the online application.
- **Statement of Purpose/Essay:** A statement of personal and professional goals (300-500 words) should be submitted as part of the online application.
- **Resume/CV:** A resume or CV should be submitted as part of the online application.
- **Transfer Credit:** Refer to Graduate School policies.
- **Transcripts:** Refer to Graduate School policies.
- **English Proficiency:** Refer to Graduate School policies.
- **Requirements for Continued Enrollment Beyond the First Semester**
 - Final, official transcript(s) showing degree award sent directly to the program, if not provided at the time of admission. The department must share final transcripts with the Graduate School to remove transcript hold for continued enrollment.
 - Upon admission, send official transcripts and degree certifications to the following address:

Graduate Admissions Committee

IU Indianapolis Department of Mathematical Sciences
402 N. Blackford Street, LD 270
Indianapolis IN 46202-3216

Email: mathgrad@iu.edu

Phone: 1-317-274-6918

- **English for Academic Purposes (EAP):** Refer to Graduate School policies regarding English proficiency and visit the [EAP website](#) for more information on testing and results. Required EAP exam and any required English course(s) taken and passed with B- or better.

Program Learning Outcomes

1. Synthesize data analysis principles across the statistical and computer sciences in topics such as pattern analysis, prediction, and big data processing.
2. Construct data science algorithms, including derivation and programming implementation in a variety of languages and platforms (C++, Python, Java, SAS, R, Matlab).
3. Be able to assess new programming language trends in industry, by gaining solid background in computing and algorithmic thinking.
4. Differentiate the processes from "raw data to outcome," which spans from considering the domain-specific constraints and characteristics (e.g., static vs. sequence, sparsity, dimensionality, etc.) to

efficient method implementation, as software with desired specifications.

5. Integrate advanced knowledge in a broad range of related topics, such as survival analysis in Computer Science.
6. Assess different solutions to specific data-specific problems.
7. Summarize state-of-the-art data science methods and applications in scientific project reports and software documentation.

Degree Requirements

The curriculum consists of 30 credit hours (which can typically be completed in three semesters). The program requires 15 credit hours of core courses (9 credit hours in Computer Science and 6 credit hours in Statistics), 12 credit hours of electives (6 credit hours in Computer Science and 6 credits in Statistics), and a 3-credit capstone course (in either Statistics or Computer Science). Successful completion of the program requires a minimum GPA of 3.00, with each course grade C or higher (no more than two courses with a grade of C or C+).

- : Core coursework is comprised of 15 credits: 9 credits in computer science, and 6 credits in statistics. Exceptions to the core coursework must be approved by the Computational Data Science Graduate Committee.
 - INFO-H 501 Introduction to Data Science Programming – 3 cr
 - CSCI-B 555 Machine Learning – 3 cr
 - CSCI-B 565 Data Mining – 3 cr
 - STAT-I 512 Applied Regression Analysis – 3 cr
 - STAT-I 529 Applied Decision Theory and Bayesian Analysis – 3 cr
- : Students will choose 12 credits of elective courses, including 6 credits in computer science and 6 credits in statistics. Exceptions to the distribution of credits between computer science and statistics, and consideration of other courses to count as electives must be approved by the Computational Data Science Graduate Committee.
 - CSCI-B 503 Algorithm Design and Analysis – 3 cr
 - CSCI-P 558 Deep Learning – 3 cr
 - CSCI-B 561 Advanced Database Concepts – 3 cr
 - CSCI-B 570 Wireless and Mobile Security – 3 cr
 - CSCI-B 575 Quantum Computing and Applications – 3 cr
 - CSCI-P 583 Data Visualization – 3 cr
 - CSCI-B 651 Natural Language Processing – 3 cr
 - CSCI-B 657 Computer Vision – 3 cr
 - STAT-I 513 Statistical Quality Control – 3 cr
 - STAT-I 514 Design of Experiments – 3 cr
 - STAT-I 520 Time Series and Applications – 3 cr
 - STAT-I 521 Statistical Computing – 3 cr
 - STAT-I 522 Sampling and Survey Techniques – 3 cr
 - STAT-I 523 Categorical Data Analysis – 3 cr
- STAT-I 524 Applied Multivariate Analysis – 3 cr
- STAT-I 525 Generalized Linear Models – 3 cr
- STAT-I 536 Introduction to Survival Analysis – 3 cr
- : There are two options to fulfill the Capstone Requirement: Option (A) industry internship or Option (B) independent study with a faculty member.
 - Option (A): **Industry internship option:** Students must create an agreement with a faculty member who will be responsible for the course associated with the internship. If the faculty member is from Math, the student should enroll in STAT-I 515. If the faculty member is from Computer Science, the student should enroll in CSCI-Y 790.
 - Option (B): **Independent study option:** In consultation with a Math or Computer Science faculty member, the student will create a plan to study an approved topic or conduct a research project with that faculty member. If the faculty member is from Math, the student should enroll in STAT-I 598. If the faculty member is from Computer Science, the student should enroll in CSCI-Y 790.
- **Required course:** one of the following (as described above):
 - STAT-I 515 Statistical Consulting Problems – 3 cr
 - CSCI-Y 790 Graduate Independent Study – 3 cr
 - STAT-I 598 Capstone Experience for CDS Program – 3 cr

Master of Science in Mathematical Sciences (Pure Math, Applied Math, Applied Statistics, and Math Education), M.S. Non-Thesis or Thesis Option

Program Descriptions

The M.S. in Mathematical Sciences offers four tracks: Pure Mathematics, Applied Mathematics, Applied Statistics, and Mathematics Education. No thesis or comprehensive examination is required for this degree, except that a written and oral final examination is required for the Applied Statistics track. Course grades must be A or B, with at most two grades of C or C+ allowed. Each student's plan of study includes several core courses specific to their track, with the remaining elective courses selected by the student in consultation with their advisory committee. An optional thesis (3 credit hours of MATH-I 698 Research) is available and can replace one to three courses in the plan of study. The expected degree duration is two years.

Admissions Requirements

- **Application Deadlines (Fall Semester) – March 1** for international applicants; **May 1** for domestic applicants. (Note: Due to sequencing of course offerings, it may not be feasible to begin some programs in the Spring semester. Interested applicants should inquire with the department before applying for Spring admission.)

- **Students entering the M.S. in Applied or Pure Mathematics program:**
 - **Prerequisite degree:** 4-yr bachelor's degree (or equivalent) from an accredited institution of higher learning in mathematics, or in the physical sciences or engineering with a strong mathematics background.
 - **Prerequisite coursework:** at least 13 credit hours of mathematics courses beyond the calculus sequence (univariate and multivariate calculus and differential equations).
- **Students entering the M.S. in Mathematics Education program:**
 - **Prerequisite degree:** 4-year bachelor's degree (or equivalent) from an accredited institution of higher learning.
 - **Prerequisite coursework:** undergraduate coursework in univariate and multivariate calculus (at IU Indianapolis, MATH-I 165, 166, 171, and 261), differential equations (MATH-I 266), linear algebra (MATH-I 351 or 511), and abstract algebra (MATH-I 453).
- **Students entering the M.S. in Applied Statistics program:**
 - **Prerequisite degree:** 4-year bachelor's degree (or equivalent) from an accredited institution of higher learning.
 - **Prerequisite coursework:** undergraduate univariate and multivariate calculus (equivalent to MATH-I 165, 166, 171, and 261 at IU Indianapolis), plus a linear algebra course (equivalent to MATH-I 351 or 511 at IU Indianapolis). Applicants who lack only the linear algebra course may be admitted conditionally and then must complete such a course as soon as possible.
- **GPA Requirement:** 0
- **Graduate Record Examination (GRE) General Test:** Not required
- **Letters of Recommendation:** Three letters of recommendation should be submitted through the online application.
- **Statement of Purpose/Essay:** A statement of personal and professional goals (300-500 words) should be submitted as part of the online application.
- **Resume/CV:** A resume or CV should be submitted as part of the online application.
- **Transfer Credit:** Refer to Graduate School policies.
- **Transcripts:** Refer to Graduate School policies.
- **English Proficiency:** Refer to Graduate School policies.
- - Final, official transcript(s) showing degree award sent directly to the program, if not provided at the time of admission. The department must share final transcripts with the Graduate School to remove transcript hold for continued enrollment.
 - Upon admission, send official transcripts and degree certifications to the following address:

Graduate Admissions Committee
 IU Indianapolis Department of Mathematical Sciences
 402 N. Blackford Street, LD 270

Indianapolis IN 46202-3216

Email: mathgrad@iu.edu

Phone: 1-317-274-6918

- **English for Academic Purposes (EAP):** Refer to Graduate School policies regarding English proficiency and visit the [EAP website](#) for more information on testing and results. Required EAP exam and any required English course(s) taken and passed with B- or better.

Program Learning Outcomes

Master of Science in Mathematical Sciences (Pure Math or Applied Math Track):

1. Demonstrate increased depth of understanding in most sub-disciplines of mathematics.
2. Integrate sub-disciplines of mathematics and other disciplines as applicable in problem solving.
3. Read and understand peer-reviewed mathematical literature.
4. Identify mathematical problems and design solutions to solve these problems.

Master of Science in Mathematical Sciences (Applied Statistics Track):

1. Demonstrate increased depth of understanding in most sub-disciplines of mathematics.
2. Integrate sub-disciplines of mathematics and other disciplines as applicable in problem solving.
3. Read and understand peer-reviewed mathematical literature.
4. Identify mathematical problems and design solutions to solve these problems.
5. Develop a deeper knowledge and competence in the area of applied statistics.

Master of Science in Mathematical Sciences (Math Education Track):

1. Develop an increased appreciation for higher mathematics
2. Learn about the sources and history of secondary mathematics
3. Learn about how abstract algebra forms the foundation for high school algebra and solving for the roots of an equation
4. Learn a deeper appreciation for mathematical analysis in order to be able to teach calculus effectively in the high school
5. Study alternate forms of geometry, including projective or hyperbolic geometry, in order to inform their teaching of proofs in high school geometry
6. Learn the art of probabilistic and statistical thinking
7. Depending on the students' interests, learn more about solving differential equations and applied mathematics
8. Study the logical foundations of mathematics in set theory or through construction and development of the number systems

Degree Requirements

The Master of Science in Mathematical Sciences has four tracks: Pure Math, Applied Math, Math Education, and Applied Statistics.

Thesis Option (Pure Math): Students who choose the thesis option will complete a written thesis that must be defended orally. The thesis topic must be approved by the student's advisor. Students must complete 6 credit hours of MATH-I 698 Research, replacing 6 credit hours of Elective Courses.

Thesis Option (Applied Math): Students who choose the thesis option will complete a written thesis that must be defended orally. The thesis topic must be approved by the student's advisor. Students must complete 6 credit hours of MATH-I 698 Research, replacing 3 credits of Capstone and 3 credits of Elective Courses.

Thesis Option (Math Education): Students who choose the thesis option will complete a written thesis that must be defended orally. The thesis topic must be approved by the student's advisor. Students must complete at least 3 credit hours of MATH-I 698 Research, replacing 3 credits of General Elective courses. Students may choose to take up to 6 additional research credits, which can replace either Math or General Elective Courses.

Minimum Grade Per Course: Course grades must be B- or better except at most two grades of C or C+.

- **Pure Math Track**

- : Core coursework consists of the following 12 credits of courses:
 - MATH-I 525 Introduction to Complex Analysis (3 cr), **OR** MATH-I 530 Functions of a Complex Variable I (3 cr)
 - MATH-I 544 Real Analysis & Measure Theory (3 cr)
 - MATH-I 553 Abstract Algebra (3 cr)
 - MATH-I 554 Linear Algebra (3 cr)
- : Elective coursework consists of 18 credit hours from the list of courses below. Substitutions to these courses may be permitted with approval of the faculty advisor and director of graduate studies. † At most 6 credits of MATH-I 598 can be used; * Variable title topics course
 - MATH-I 514 Numerical Analysis (3 cr)
 - MATH-I 518 Advanced Discrete Mathematics (3 cr)
 - MATH-I 520 Boundary Value Problems of Differential Equations (3 cr)
 - MATH-I 523 Introduction to Partial Differential Equations (3 cr)
 - MATH-I 545 Principles of Analysis II (3 cr)
 - MATH-I 546 Introduction to Functional Analysis (3 cr)
 - MATH-I 561 Projective Geometry (3 cr)
 - MATH-I 562 Introduction to Differential Geometry and Topology (3 cr)
 - MATH-I 563 Advanced Geometry (3 cr)
 - MATH-I 567 Dynamical Systems I (3 cr)
 - MATH-I 571 Elementary Topology (3 cr)
 - MATH-I 574 Mathematical Physics I (3 cr)
 - MATH-I 598 Topics in Mathematics (3 cr)

* †

- STAT-I 519 Introduction to Probability (3 cr)
- : Students choosing the thesis option must complete 6 credit hours of MATH-I 698 Research, replacing 6 credit hours of Elective Courses.
- **Applied Math Track**
 - : Core coursework consists of the following 12 course credits:
 - MATH-I 507 Intermediate Linear Algebra (3 cr)
 - MATH-I 514 Numerical Analysis (3 cr)
 - MATH-I 552 Applied Computational Methods II (3 cr)
 - STAT-I 517 Statistical Inference (3 cr), **OR** STAT-I 519 Introduction to Probability (3 cr)
 - Elective coursework consists of 15 credit hours from the list of courses below. Substitutions to these courses may be permitted with approval of the faculty advisor and director of graduate studies.† At most 6 credits of MATH-I 598 can be used; * Variable title topics course.
 - MATH-I 518 Advanced Discrete Mathematics (3cr)
 - MATH-I 520 Boundary Value Problems of Differential Equations (3 cr)
 - MATH-I 522 Qualitative Theory of Differential Equations (3 cr)
 - MATH-I 523 Introduction to Partial Differential Equations (3 cr)
 - MATH-I 525 Introduction to Complex Analysis (3 cr), **OR**
 - MATH-I 530 Functions of a Complex Variable I (3 cr)
 - MATH-I 526 Principles of Mathematical Modeling (3 cr)
 - MATH-I 535 Theoretical Mechanics (3 cr)
 - MATH-I 537 Applied Mathematics for Scientists and Engineers (3 cr)
 - MATH-I 544 Real Analysis and Measure Theory (3 cr)
 - MATH-I 554 Linear Algebra (3 cr)
 - MATH-I 555 Introduction to Biomathematics (3 cr)
 - MATH-I 562 Introduction to Differential Geometry and Topology (3 cr)
 - MATH-I 571 Elementary Topology (3 cr)
 - MATH-I 578 Mathematical Modeling of Physical Systems I (3 cr)
 - MATH-I 598 Topics in Mathematics (3 cr) * †
 - STAT-I 512 Applied Regression Analysis (3 cr)
 - STAT-I 514 Designs of Experiments (3 cr)

- STAT-I 520 Time Series and Applications (3 cr)
- STAT-I 524 Applied Multivariate Analysis (3 cr)
- STAT-I 528 Mathematical Statistics (3 cr)
- There are two options to fulfill the Capstone Requirement: Option (A) industry internship or Option (B) independent study with a faculty member.
 - Option (A): **Industry internship option:** Students must create an agreement with a faculty member who will be responsible for the course associated with the internship. If the faculty member is from Math, the student should enroll in 3 credits of MATH-I 598.
 - Option (B): **Independent study option:** In consultation with a Math faculty member, the student will create a plan to study an approved topic or conduct a research project with that faculty member. If the faculty member is from Math, the student should enroll in 3 credits of MATH-I 598.
- : Students choosing the thesis option must complete 6 credit hours of MATH-I 698 Research, replacing 3 credits of Capstone and 3 credits of Elective Courses.
- **Math Education Track**
 - : Core coursework consists of the following 18 credits of courses. Substitutions to these courses may be permitted with approval of the faculty advisor and director of graduate studies.
 - MATH-I 505 Intermediate Abstract Algebra (3 cr)
 - MATH-I 547 Analysis for Teachers I (3 cr), **OR** MATH-I 504 Real Analysis (3 cr)
 - MATH-I 563 Advanced Geometry (3 cr), **OR** MATH-I 561 Projective Geometry (3 cr)
 - MATH-I 518 Advanced Discrete Mathematics (3 cr)
 - STAT-I 516 Basic Probability and Applications (3 cr)
 - STAT-I 517 Statistical Inference (3 cr)
 - : Math Electives: 6 credit hours must be from the following list of courses below. Substitutions to these courses may be permitted with approval of the faculty advisor and director of graduate studies. † At most 3 credits of MATH-I 598 can be used: * Variable title topics course
 - MATH-I 525 Introduction to Complex Analysis (3 cr)
 - MATH-I 549 Applied Mathematics for Secondary School Teachers (3 cr)
 - MATH-I 581 Introduction to Logic for Teachers (3 cr)
 - MATH-I 583 History of Elementary Mathematics (3 cr)
 - MATH-I 598 Topics in Mathematics (3 cr)* †
- : Two advanced courses (3 credits each) in a related area of mathematics, mathematics education, psychology, or education that are approved by the student's faculty advisor or committee.
- : Students choosing the thesis option must complete 3 credit hours of MATH-I 698 Research, replacing 3 credits of General Elective courses. A student may choose to take up to 6 additional research credits, which can replace either Math or General Elective Courses.
- **Applied Statistics Track**
 - :
 - STAT-I 512 Applied Regression Analysis – 3 cr
 - STAT-I 514 Design of Experiments – 3 cr
 - STAT-I 519 Introduction to Probability – 3 cr
 - STAT-I 524 Applied Multivariate Analysis – 3 cr
 - STAT-I 528 Mathematical Statistics – 3 cr
 - : Elective coursework consists of 15 credit hours, with at least 9 of which must be statistics (STAT-I) courses. The other 6 credits may be taken in mathematics or in areas relevant to statistical applications, subject to approval of the faculty advisor. † At most 6 credits of MATH-I 598 can be used; * Variable title topics course
 - STAT-I 513 Statistical Quality Control – 3 cr
 - STAT-I 515 Statistical Consulting Problems – 3 cr
 - STAT-I 520 Time Series and Applications – 3 cr
 - STAT-I 521 Statistical Computing – 3 cr
 - STAT-I 522 Sampling and Survey Techniques – 3 cr
 - STAT-I 523 Categorical Data Analysis – 3 cr
 - STAT-I 525 Generalized Linear Models – 3 cr
 - STAT-I 529 Bayesian Statistics and Applied Decision Theory – 3 cr
 - STAT-I 532 Elements of Stochastic Processes – 3 cr
 - STAT-I 533 Nonparametric Statistics – 3 cr
 - STAT-I 536 Introduction to Survival Analysis – 3 cr
 - STAT-I 598 Topics in Statistical Methods – 3 cr * †
 - : In addition to the above coursework, each student must pass a Theory Comprehensive Examination and an Applied Comprehensive Examination over the material in the core courses.
 - Students who choose the thesis option will complete a written thesis that must be defended orally. The thesis topic must be approved by the student's advisor.

Students must complete 6 credit hours of STAT-I 698 Research, replacing 6 credit hours of the Elective Courses. The Elective Courses Requirement is reduced to 9 credits, which consists of at least 6 credits of Statistics courses, and may include 3 credits in mathematics or in areas relevant to statistical applications. The faculty advisor must approve any course outside of Statistics.

Doctor of Philosophy in Mathematical Sciences

Program Description

The Ph.D. in Mathematical Sciences is offered in the Department of Mathematical Sciences. Students earning a Ph.D. in Mathematical Sciences have the option to specialize in pure mathematics, applied mathematics or mathematical statistics. Our department is currently doing research in integrable systems, mathematical physics, dynamical systems, noncommutative geometry, operator algebras, differential geometry, partial differential equations, functional analysis, statistics and probability, applied mathematics, biomathematics, computational neurosciences, and scientific computing.

Admissions Requirements

- **Application Deadlines (Fall Semester) – February 1 for all applicants.** *(Note: Due to sequencing of course offerings, it may not be feasible to begin some programs in the Spring semester. Interested applicants should inquire with the department before applying for Spring admission).*
- **Prerequisite degree:** Students entering the Ph.D. program in mathematics must have either an M.S. in mathematics or have successfully completed a bachelor's degree (or equivalent) from an accredited university, with advanced courses in mathematics.
- **Prerequisite coursework:** Competitive applicants will have successfully completed the following course work: linear algebra, abstract algebra, complex analysis, partial differential equations (PDE), ordinary differential equations (ODE), mathematical statistics, probability.
- **GPA Requirement:** 0
- **Graduate Record Examination (GRE) General Test:** Not required
- **Letters of Recommendation:** Three letters of recommendation should be submitted through the online application.
- **Statement of Purpose/Essay:** A statement of personal and professional goals (300-500 words) should be submitted as part of the online application.
- **Resume/CV:** A resume or CV should be submitted as part of the online application.
- **Transfer Credit:** Refer to Graduate School policies.
- **Transcripts:** Refer to Graduate School policies.
- **English Proficiency:** Refer to Graduate School policies.
- **Requirements for Continued Enrollment Beyond the First Semester:**
 - **Final, official transcript(s)** showing degree award sent directly to the program, if not

provided at the time of admission. The department must share final transcripts with the Graduate School to remove transcript hold for continued enrollment.

- Upon admission, send official transcripts showing degree was awarded (include degree certifications if institution does not include degree award on the transcript) to the following address:

Graduate Admissions Committee

IU Indianapolis Department of Mathematical Sciences
402 N. Blackford Street, LD 270
Indianapolis IN 46202-3216

Email: mathgrad@iu.edu

Phone: 1-317-274-6918

- **English for Academic Purposes (EAP):** Refer to Graduate School policies regarding English proficiency and visit the [EAP website](#) for more information on testing and results.

Program Learning Outcomes

In addition to the Student Learning Outcomes for the M.S. degree, those who graduate with a Ph.D. degree in Mathematics will be able to:

- Demonstrate a basic understanding of the fundamental ideas underlying the basic mathematical disciplines.
- Demonstrate the ability to recognize significant research problems.
- Demonstrate the ability to analyze problems, reach research solutions, and transmit the fundamental ideas to others.
- Demonstrate a comprehensive knowledge in mathematical sciences through successful completion of a qualifying and preliminary examination.
- Document an original contribution to mathematics through independent experimental design, peer-reviewed publication of results, and presentation and defense of an original thesis.

Degree Requirements

The Mathematical Sciences PhD is a 90-credit degree designed to be completed over a period of 4–6 years. Students select one of five PhD tracks: Statistics, Applied Math, Mathematical Analysis, Geometry & Topology, or Algebra & Discrete Math. The program includes a 42-credit Mathematical Sciences coursework requirement, which is composed of 12 credits of core curriculum courses, 6 credits of mathematical or statistical subject courses, 9 credits of approved advanced-level courses, and 15 credits of additional elective courses. Courses taken to satisfy the PhD minor do not count toward the 42-credit math/stat course requirement. Precise descriptions of these coursework requirements are provided below. Required EAP exam and any required English course(s) taken and passed with B- or better. Course grades must be B- or better except at most two grades of C or C+. However, all core courses must be completed with a minimum grade of "B-" (or the corresponding Preliminary Exam must be passed in lieu of taking the course).

- **Core Curriculum Courses (12 credits):** All Core courses must be completed with a minimum grade of "B-" (or the corresponding Preliminary Exam must

be passed in lieu of taking the course). Substitutions to these courses may be permitted with approval of the faculty advisor and director of graduate studies. Students who are exempt from any of the Core courses by passing the corresponding preliminary exam must replace those credits with Elective course credits.

- MATH-I 530 - Introduction to Complex Variables I - 3 cr.
- MATH-I 544 - Real Analysis and Measure Theory - 3 cr.
- MATH-I 553 - Abstract Algebra - 3 cr.
- MATH-I 554 - Linear Algebra - 3 cr.
- **Mathematical or Statistical Subject Courses (6 credits):** Students will choose **6 credits** from the following Math or Statistics Subject courses. Substitutions may be permitted with approval of the faculty advisor and Director of Graduate Studies.
 - MATH-I 514 - Numerical Analysis - 3 cr.
 - MATH-I 523 - Partial Differential Equations - 3 cr.
 - MATH-I 562 - Intro to Differential Geometry and Topology - 3 cr.
 - MATH-I 571 - Elementary Topology - 3 cr.
 - MATH-I 572 - Intro to Algebraic Topology - 3 cr.
- STAT-I 519 - Introduction to Probability - 3 cr.
- **Advanced-Level Course Requirement in Major Area (9 credits):** Students will choose 9 credits of Advanced-Level courses in the student's track or closely related to it.
 - **Statistics Advanced-Level Course Requirement:** Students in the Statistics track are required to complete the following **6 credits**:
 - STAT-I 619 - Probability Theory - 3 cr.
 - STAT-I 628 - Advanced Statistical Inference - 3 cr.
 - **Plus 3 credits** from the following:
 - STAT-I 598 - Advanced Topic in Applied Statistics I - 3 cr.
 - STAT-I 598 - Advanced Topic in Applied Statistics II - 3 cr.
 - STAT-I 598 - Advanced Topic in Probability I - 3 cr.
 - STAT-I 598 - Advanced Topic in Probability II - 3 cr.
 - **Applied Math Advanced-Level Course Requirement:** Students in the Applied Mathematics track are required to complete **6 credits** chosen from the following courses:
 - MATH-I 514 - Numerical Analysis - 3 cr.
 - MATH-I 526 - Principles of Mathematical Modeling - 3 cr.
 - MATH-I 535 - Theoretical Mechanics - 3 cr.
 - MATH-I 552 - Applied Computational Methods II - 3 cr.
 - **Plus 3 credits** from the following courses:
- BIOL-I 556 - Physiology I - 3 cr.
- BIOL-I 557 - Physiology II - 3 cr.
- CHEM-I 682 - Statistical Thermodynamics - 3 cr.
- MATH-I 598 - Advanced Topics in Applied Mathematics - 3 cr.
- NSCI-I 571 - Developmental Neurobiology - 3 cr.
- PHYS-I 517 - Statistical Physics - 3 cr.
- PHYS-I 600 - Methods of Theoretical Physics - 3 cr.
- **Pure Math Advanced-Level Course Requirement (including Algebra & Discrete Math, Mathematical Analysis, and Geometry & Topology) (9 credits):** Students in any of the three Pure Mathematics tracks are required to complete 9 credits chosen from the following courses:
 - MATH-I 531 - Functions of a Complex Variable II - 3 cr.
 - MATH-I 545 - Principles of Analysis II - 3 cr.
 - MATH-I 546 - Introduction to Functional Analysis - 3 cr.
 - MATH-I 567 - Dynamical Systems I - 3 cr.
 - MATH-I 572 - Introduction to Algebraic Topology - 3 cr.
 - MATH-I 574 - Mathematical Physics I - 3 cr.
 - MATH-I 598 - Advanced Topics in Pure Mathematics - 3 cr. (No more than 3 credits can be used toward the Advanced-Level Course Requirement)
 - MATH-I 646 - Functional Analysis - 3 cr.
 - MATH-I 667 - Dynamical Systems II - 3 cr.
 - MATH-I 672 - Algebraic Topology I - 3 cr.
 - MATH-I 673 - Algebraic Topology II - 3 cr.
 - MATH-I 674 - Mathematical Physics II - 3 cr.
 - MATH-I 693 - Topics in Analysis* - 3 cr.
 - MATH-I 694 - Topics in Differential Equations* - 3 cr.
 - MATH-I 697 - Topics in Topology* - 3 cr.
 - *Variable-title Course
- **Students who are exempt** from any of the Core courses by passing the corresponding preliminary

exam must take additional elective courses to bring the total number of credits between core and elective courses to 42 credits.

- **Students who transfer fewer than 12 credits** of coursework from an awarded master's degree and/or other non-degree enrollment must take additional elective courses to bring the total number of credits to 90 credits, so as not to exceed 30 credits of dissertation research.
- The **total number of MATH-I 598 / STAT-I 598 credits** used toward the Additional Elective course requirement is **limited to 9 credits**. Exceptions must be approved by the director of graduate studies.
- The **total number of STAT-I 515 credits** used toward the additional elective course requirement is **limited to 3 credits**. Exceptions must be approved by the Director of Graduate Studies.
- For additional elective courses, students should choose **at least 15 credits (see the second bullet point above)** from the following list:
 - MATH-I 514 - Numerical Analysis - 3 cr.
 - MATH-I 518 - Advanced Discrete Mathematics - 3 cr.
 - MATH-I 523 - Partial Differential Equations - 3 cr.
 - MATH-I 526 - Principles of Mathematical Modeling - 3 cr.
 - MATH-I 531 - Functions of a Complex Variable II - 3 cr.
 - MATH-I 535 - Theoretical Mechanics - 3 cr.
 - MATH-I 545 - Principles of Analysis II - 3 cr.
 - MATH-I 546 - Introduction to Functional Analysis - 3 cr.
 - MATH-I 552 - Applied Computational Methods II - 3 cr.
 - MATH-I 555 - Introduction to Biomathematics - 3 cr.
 - MATH-I 562 - Differential Geometry - 3 cr.
 - MATH-I 563 - Advanced Geometry - 3 cr.
 - MATH-I 567 - Dynamical Systems I - 3 cr.
 - MATH-I 571 - Elementary Topology - 3 cr.
 - MATH-I 572 - Introduction to Algebraic Topology - 3 cr.
 - MATH-I 574 - Mathematical Physics I - 3 cr.
 - MATH-I 578 - Mathematical Modeling of Physical Systems I - 3 cr.
 - MATH-I 588 - Mathematical Modeling of Physical Systems II - 3 cr.
 - MATH-I 598 - Topics in Mathematics* - 3 cr.
 - MATH-I 646 - Functional Analysis - 3 cr.
 - MATH-I 667 - Dynamical Systems II - 3 cr.
 - MATH-I 672 - Algebraic Topology I - 3 cr.
 - MATH-I 673 - Algebraic Topology II - 3 cr.
 - MATH-I 674 - Mathematical Physics II - 3 cr.
 - MATH-I 692 - Topics in Applied Mathematics* - 3 cr.
 - MATH-I 693 - Topics in Analysis* - 3 cr.
 - MATH-I 694 - Topics in Differential Equations* - 3 cr.
 - MATH-I 697 - Topics in Topology* - 3 cr.
 - STAT-I 512 - Applied Regression Analysis - 3 cr.
 - STAT-I 513 - Statistical Quality Control - 3 cr.
 - STAT-I 514 - Designs of Experiments - 3 cr.
 - STAT-I 515 - Statistical Consulting Problems** - 3 cr.
 - STAT-I 519 - Introduction to Probability - 3 cr.
 - STAT-I 520 - Time Series and Applications - 3 cr.
 - STAT-I 521 - Statistical Computing - 3 cr.
 - STAT-I 522 - Sampling and Survey Techniques - 3 cr.
 - STAT-I 523 - Categorical Data Analysis - 3 cr.
 - STAT-I 524 - Applied Multivariate Analysis - 3 cr.
 - STAT-I 525 - Generalized Linear Models - 3 cr.
 - STAT-I 528 - Intro to Mathematical Statistics - 3 cr.
 - STAT-I 529 - Applied Decision Theory and Bayesian Statistics - 3 cr.
 - STAT-I 532 - Elements of Stochastic Processes - 3 cr.
 - STAT-I 533 - Non-Parametric Statistics - 3 cr.
 - STAT-I 536 - Introduction to Survival Analysis - 3 cr.
 - STAT-I 598 - Topics in Statistics* - 3 cr.
 - STAT-I 619 - Probability Theory - 3 cr.

- STAT-I 628 - Advanced Statistical Inference - 3 cr.
- **Dissertation Research (12 credits minimum):** Dissertation Research credits must be taken for at least 12 credits and up to 30 credits to reach 90 total credits, dependent upon the student's number of graduate transfer credits.
 - **MATH-I 699 – Dissertation Research – variable credit**
- **PhD Minor (6 credits):** The minor consists of advanced coursework completed within an Indiana University approved minor program, as approved by the student's advisory committee and the chairperson of the department hosting the minor. If a student chooses to complete a minor within the Department of Mathematical Sciences, then the minor area must be different from the student's track. **Courses taken to satisfy the minor do not count toward the 42-credit math/stat course requirement.**

Examinations and Degree Progression

Preliminary Examinations: A student must pass 4 written examinations based on material covered in the courses listed below and on material from undergraduate prerequisite courses.

- **Core 4 Preliminary Exams:**
 - Complex Analysis (MATH-I 530)
 - Real Analysis (MATH-I 544)
 - Abstract Algebra (MATH-I 553)
 - Linear Algebra (MATH-I 554)
- **Area Preliminary Exams:**
 - Numerical Analysis (MATH-I 514)
 - Probability (STAT-I 519)
 - Partial Differential Equations (MATH-I 523)
 - Differential Geometry (MATH-I 562)
 - Topology (MATH-I 571)
 - Mathematical Statistics (STAT-I 528)*
- These three-hour exams are offered twice per year shortly before classes start in August and in January. The Graduate Committee will oversee the process of writing and grading the preliminary exams.
- The deadline to complete these exams for students who enter the program with a master's degree or equivalent is 1.5 academic years after admission to the program. For incoming students without a master's degree, the deadline is 2.5 academic years after admission to the program.
- All students must pass either the Real Analysis (MATH-I 544) or Abstract Algebra (MATH-I 553) preliminary exams, and one additional Core 4 preliminary exam. The student also must pass two additional preliminary exams from either the remaining Core 4 or the Area Exams. (Statistics students see below.) If a student passes a Core 4 preliminary exam before taking the corresponding Core 4 course, the requirement to pass that course (as described below) is waived, and credits will be replaced by elective course credits.

- Students in the PhD program who are focusing on Statistics typically take the following four exams: Real Analysis, Linear Algebra, Probability, and Mathematical Statistics. *Moreover, the Mathematical Statistics qualifying exam is **only** available for statistics students.

Advisory Committee: After a student has completed the Core 4 courses and satisfied the Preliminary Exam requirement, the student will form their advisory committee. The Advisory Committee must include at least two members from the student's track and one from a different track. The faculty advisor and at least one other member of the Advisory Committee must be endorsed IU graduate faculty members.

Qualifying Examination: A student must give an oral presentation (1-2 hours) to demonstrate proficiency in the planned dissertation research topic. The student's Advisory Committee will determine the rubric for passing. The Qualifying Exam should be passed within 1.5 years of the student completing their Preliminary Exam requirement but not before completing at least 20 didactic course credits. The Qualifying Exam can be taken at most twice.

Foreign Language Exam: The student must satisfy the foreign language requirement in French, German, or Russian within two years of completing their Preliminary Exam requirement. Students will prove their proficiency in the language by translating 2-3 pages of mathematical literature. If the student's native language is listed above, the student may be exempted from this requirement.

Research Committee: After a student has completed the Qualifying Examination, the student will form their research committee. The Research Committee must adhere to Graduate School requirements.

Dissertation Research: Dissertation Research credits must be taken for at least 12 credits and up to 30 credits to reach 90 total credits, dependent upon the student's number of graduate transfer credits. **MATH-I 699 – Dissertation Research – variable credit**

Mathematical Sciences Minors in the School of Science

Algebra and Discrete Math Ph.D. Minor (6 cr.)

This minor is valuable for students interested in logic, problem-solving, and mathematical structures that underlie computer science, cryptography, data science, and advanced mathematics.

Required Courses (choose 2):

- MATH-I 518 Advanced Discrete Mathematics (3 cr.)
- MATH-I 574 Mathematical Physics I (3 cr.)
- MATH-I 674 Mathematical Physics II (3 cr.)

Applied Mathematics Ph.D. Minor (6 cr.)

This minor is ideal for students interested in using mathematical techniques to solve real-world problems in engineering, physics, finance, and data science.

Required Courses (choose 2):

- MATH-I 514 Numerical Analysis (3 cr.)

- MATH-I 520 Boundary Value Problems of Differential Equations (3 cr.)
- MATH-I 522 Qualitative Theory of Differential Equations (3 cr.)
- MATH-I 526 Principles of Mathematical Modeling (3 cr.)
- MATH-I 535 Theoretical Mechanics (3 cr.)
- MATH-I 552 Applied Computational Methods II (3 cr.)
- MATH-I 555 Introduction to Biomathematics (3 cr.)
- MATH-I 578 Mathematical Modeling of Physical System I (3 cr.)
- MATH-I 588 Mathematical Modeling of Physical Systems II (3 cr.)

Applied Statistics Ph.D. Minor (12 credits)

Required Courses:

- STAT-I 511 Statistical Methods I (3 cr.)
- STAT-I 512 Applied Regression Analysis (3 cr.)

Elective Courses (choose 2):

- STAT-I 513 Statistical Quality Control (3 cr.)
- STAT-I 514 Design of Experiments (3 cr.)
- STAT-I 521 Statistical Computing (3 cr.)
- STAT-I 522 Sampling and Survey Techniques (3 cr.)
- STAT-I 523 Categorical Data Analysis (3 cr.)
- STAT-I 529 Bayesian Statistics and Applied Decision Theory (3 cr.)
- STAT-I 533 Nonparametric Statistics (3 cr.)
- STAT-I 536 Introduction to Survival Analysis (3 cr.)
- *Additional Electives that require Math Department approval:*
 - STAT-I 519 Introduction to Probability (3 cr.)
 - STAT-I 528 Mathematical Statistics I (3 cr.)
 - STAT-I 524 Applied Multivariate Analysis (3 cr.)
 - STAT-I 525 Generalized Linear Models (3 cr.)

Computational Data Science Ph.D. Minor (12 credits)

Required Courses (choose 1):

- CSCI-B 565 Data Mining (3 cr.)
- CSCI-B 555 Machine Learning (3 cr.)

Elective Courses (choose 3, including 1 course from the Computer Science Electives list distinct from the required course chosen and 2 courses from the Statistics Electives list):

Computer Science Electives (choose 1):

- CSCI-B 561 Advanced Database Concepts (3 cr.)
- CSCI-P 583 Data Visualization (3 cr.)
- CSCI-B 565 Data Mining (3 cr.)
- CSCI-B 555 Machine Learning (3 cr.)
- INFO-H 501 Introduction to Data Science Programming (3 cr.)
- CSCI 59000 Big Data Management (3 cr.)

Statistics Electives (choose 2):

- STAT-I 512 Applied Regression Analysis (3 cr.)
- STAT-I 520 Time Series and Applications (3 cr.)

- STAT-I 523 Categorical Data Analysis (3 cr.)
- STAT-I 528 Mathematical Statistics (3 cr.)
- STAT-I 529 Applied Decision Theory and Bayesian Analysis (3 cr.)
- STAT-I 536 Introduction to Survival Analysis (3 cr.)
- STAT-I 524 Applied Multivariate Analysis (3 cr.)
- STAT-I 525 Generalized Linear Models (3 cr.)

Geometry and Topology Ph.D. Minor (6 cr.)

This minor is ideal for students interested in the deep mathematical structures underlying space, shape, and transformation, with applications in physics, engineering, computer graphics, robotics, and theoretical research.

Required courses (choose 2):

- MATH-I 562 Introduction to Differential Geometry and Topology (3 cr.)
- MATH-I 563 Advanced Geometry (3 cr.)
- MATH-I 571 Elementary Topology (3 cr.)
- MATH-I 572 Introduction to Algebraic Topology (3 cr.)
- MATH-I 567 Dynamical Systems I (3 cr.)
- MATH-I 667 Dynamical Systems II (3 cr.)
- MATH-I 672 Algebraic Topology I (3 cr.)
- MATH-I 673 Algebraic Topology II (3 cr.)

Mathematical Analysis Ph.D. Minor (6 cr.)

This minor is ideal for students interested in the rigorous foundations of calculus, differential equations, and mathematical physics, with applications in engineering, physics, finance, and computational science.

Required courses (choose 2):

- MATH-I 520 Boundary Value Problems of Differential Equations (3 cr.)
- MATH-I 523 Introduction to Partial Differential Equations (3 cr.)
- MATH-I 531 Functions of a Complex Variable II (3 cr.)
- MATH-I 545 Principles of Analysis II (3 cr.)
- MATH-I 546 Introduction to Functional Analysis (3 cr.)
- MATH-I 574 Mathematical Physics I (3 cr.)
- MATH-I 674 Mathematical Physics II (3 cr.)
- MATH-I 646 Functional Analysis (3 cr.)

Mathematical Sciences Ph.D. Minor (6 cr.)

This minor provides a broad foundation in pure and applied mathematics, equipping students with strong analytical, computational, and problem-solving skills.

Required courses (choose 2):

- Any 500-level MATH or STAT courses.

Statistics Ph.D. Minor (6 cr.)

A Statistics minor provides essential skills in data analysis, probability, and statistical modeling, making it highly valuable for careers in data science, finance, engineering, healthcare, social sciences, and research.

Required courses (choose 2):

- STAT-I 512 Applied Regression Analysis (3 cr.)
- STAT-I 513 Statistical Quality Control (3 cr.)
- STAT-I 514 Design of Experiments (3 cr.)
- STAT-I 519 Introduction to Probability (3 cr.)
- STAT-I 520 Time Series and Applications (3 cr.)
- STAT-I 521 Statistical Computing (3 cr.)
- STAT-I 522 Sampling and Survey Techniques (3 cr.)
- STAT-I 523 Categorical Data Analysis (3 cr.)
- STAT-I 524 Applied Multivariate Analysis (3 cr.)
- STAT-I 525 Generalized Linear Model (3 cr.)
- STAT-I 528 Mathematical Statistics I (3 cr.)
- STAT-I 529 Bayesian Statistics and Applied Decision Theory (3 cr.)
- STAT-I 532 Elements of Stochastic Processes (3 cr.)
- STAT-I 533 Nonparametric Statistics (3 cr.)
- STAT-I 536 Introduction to Survival Analysis (3 cr.)
- STAT-I 619 Probability Theory (3 cr.)
- STAT-I 628 Advanced Statistical Inference (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Medical and Molecular Genetics

School of Medicine

Departmental URL: medicine.iu.edu/genetics

Curriculum

Degrees Offered

Master of Science in Medical and Molecular Genetics and
Doctor of Philosophy

Master of Science Degree in Medical and Molecular Genetics (non-counseling track)

Admission Requirements

MS Research/Non-counseling track: Bachelor's degree or its equivalent, including two years of chemistry, two years of biology, and one course in principles of genetics. Promising students deficient in one or more areas may be accepted if it appears to the admissions committee that deficiencies can be removed during graduate study. Results of the Graduate Record Examination (GRE) General Test are not required for admission.

MS Program Student Learning Outcomes – Research MS program

Students completing the research-focused Master of Science (MS) in Medical and Molecular Genetics will be able to:

1. Demonstrate depth of understanding in medical and molecular genetics.
2. Integrate biological knowledge and information incorporating cellular, molecular, genetic, physiologic and biochemical approaches.
3. Apply critical thinking to access, analyze and evaluate literature and research data in the context of genetics.
4. Summarize and present scientific ideas and genetic information.

5. For students pursuing the thesis MS, propose a major area of research and conduct independent research under the mentoring of a research advisor, write and defend the thesis.

MS Non-counseling Program Requirements

For students not in the genetic counseling study track, a minimum of 30 credit hours of approved courses is required to complete the MS degree, of which no more than 7 credit hours of research (MGEN Q-800) can be used for the 30-credit minimum. Students have the option to complete a thesis.

Required courses for non-thesis and thesis options:

- MGEN-Q580 Basic Human Genetics (3 cr)
- MGEN-Q625 Introduction to Clinical Genetics (1cr)
- MGEN-Q612 Mol and Biochem Genetics (3 cr)
- MGEN-Q620 Human Cytogenetics (2 cr)
- MGEN-Q630 Population Genetics (1 cr)

Additional courses to complete the 30-credit hour requirement for both non-thesis and thesis options:

- MGEN Q610 Clinical Genetics Practicum (3 CR)
- MGEN Q613 Molecular and Biochemical Genetics Lab (2 CR).
- GRDM G724 Molecular Cancer Genetics (1 CR)
- GRDM G725 Gene Therapy (1 CR)
- GRDM G726 Developmental Genetics (1 CR); not currently active
- GRDM G727 Animal Models of Human Disease (1 CR)
- GRDM G716 Molecular Biology and Genetics (2 CR)
- GRDM G848 Bioinformatics, Genomics and Proteomics (2 CR)
- PBHL B561 and/or PBHL B562 Biostats I and II (3 CR each)
- MGEN G788/ INFO I590 Next Generation Sequencing (3 CR)
- GRDM G888 Single-Cell and Spatial Omics (2 CR)
- GRDM G889 Single-Cell and Spatial Omics Practical Lab (1 CR)
- MGEN-Q800 Medical Genetics Research
- Other Relevant Indiana University Graduate Courses as approved by Graduate Advisor

The Graduate Advisor must review and approve all additional courses prior to student enrollment to ensure the courses fit with the student's plan of study to fulfill the MS degree. The student must maintain a minimum of 3.0 GPA and a B or better in all coursework.

Students may work with departmental faculty within their labs as part of their educational program. When this occurs, students should enroll in research credit hours (MGEN Q-800) to receive credit toward their plan of study and degree requirements.

Thesis Option

Thesis students should work with an approved faculty mentor within the department to prepare and defend a master's thesis. Thesis students should enroll in research credit hours (MGEN Q-800) throughout their thesis preparation. Research courses should be used in place

of the additional/elective courses listed on the shared program plan above.

Final Examination

The completion and passing of a written exam, oral exam, or combined written and oral exam is at the discretion of the student's advisory committee.

Program Termination

Academic or research deficiency will result in termination of the student's enrollment in the program.

Admission Requirements

MS Genetic Counseling plan

Bachelor's degree or its equivalent, including at least one semester in biology, genetics, psychology and either organic chemistry or biochemistry. Results of the Graduate Record Examination (GRE) General test are not required for admission.

MS Program Student Learning Outcomes –Genetic Counseling MS program

The goal of the Master of Science degree in Medical and Molecular Genetics through the Genetic Counseling Graduate Program is to prepare graduates to practice competently and ethically in clinic- and non-clinic-based genetic counseling roles. Upon successful completion of the degree requirements and submission of an approved case logbook, graduates are eligible to apply to take the American Board of Genetic Counseling (ABGC) certification exam.

Upon completion of the program, students will be able to:

1. Develop an effective clinical genetic counseling patient plan by:
 1. Extracting and analyzing relevant information from the medical record and family history.
 2. Critically evaluating and synthesizing clinical and molecular genetics literature.
 3. Accurately assessing patients' risk for genetic disorders based on family pedigrees and other risk factors using principles of population genetics and clinical risk assessment models.
 4. Designing a genetic testing strategy based on a patient's medical history, family history and critical evaluation of genetic testing modalities to select and facilitate the most appropriate genetic testing.
 5. Correctly interpreting genetic variants and other genetic test results.
2. Implement and independently manage a clinical genetic counseling session in a variety of service delivery modes by:
 1. Utilizing a variety of patient interview techniques.
 2. Devising strategies to respond to emerging needs of genetic counseling clients.
 3. Applying clinical communication and psychosocial techniques to facilitate effective patient education, decision-making, coping, adaptation and support regarding inherited disease.

3. Apply medical genetics, quantitative, molecular, biochemical and cytogenetic principles to clinical problems in pediatric, adult, prenatal, cancer, neurologic, cardiovascular, and metabolic genetics.
4. Behave and practice genetic counseling in accordance with the National Society of Genetic Counselors (NSGC) Code of Ethics, state, federal and local laws and institutional regulations.
5. Identify healthcare and health outcome disparities based on differences in race, gender, gender identity, sexuality, disability, religion and other factors.
6. Collaborate with interdisciplinary team members to improve clinical care and patient outcomes.
7. Implement, conduct and disseminate results of clinical genetic counseling research.
8. Analyze the role of non-patient-facing genetic counselors in a variety of industry and laboratory settings.
9. Design a professional development plan for maintaining certification and contributing to educational, policy-making, and social aspects of clinical genetics.
10. Demonstrate accountability and self-reflection in professional practice.

Genetic Counseling MS Program Requirements

For students on the genetic counseling study plan to meet requirements to take the certification examination of the American Board of Genetic Counseling, a minimum of 47 credit hours of approved courses must be taken in medical genetics. Required courses include at least 12 hours in clinical practicum courses (from MGEN-Q610, MGEN-Q710-Q717, or approved equivalent) and at least two credit hours of genetic counseling research (MGEN-Q810, MGEN-Q811) for the required genetic counseling graduate research project (see below). Students must earn a B- or better in all departmental coursework and maintain a minimum of a 3.0 GPA.

Required courses:

- MGEN-Q580 Basic Human Genetics (3 cr)
- MGEN-Q600 Practical Prenatal Genetic Counseling (2 cr)
- MGEN-Q604 Genetic Counseling Communication Techniques (4 cr)
- MGEN-Q606 Foundations in Genetic Counseling (2 cr)
- MGEN-Q608 Introduction to Genetic Counseling Research (1 cr)
- MGEN-Q619 Practical Neurogenetics Genetic Counseling (1 cr)
- MGEN-Q624 Clinical Genetics & Management of Metabolic Disease (1 cr)
- MGEN-Q609 Practical Cancer Genetic Counseling (2 cr)
- MGEN-Q610 Medical Genetics Practicum (3 cr)
- MGEN-Q612 Molecular and Biochemical Genetics (3 cr)
- MGEN-Q618 Practical Cardiovascular Genetic Counseling (2 cr)
- MGEN-Q620 Human Cytogenetics (2 cr)
- MGEN-Q630 Population Genetics (1 cr)

- MGEN-Q710 Advanced Clinical Genetics Practicum (2 cr)
- MGEN-Q711 Metabolic Genetic Counseling Clinical Practicum (1 cr)
- MGEN-Q712 Cardiovascular Genetic Counseling Clinical Practicum (1 cr)
- MGEN-Q713 Cancer Genetic Counseling Clinical Practicum (1 cr)
- MGEN-Q714 Advanced Cancer Genetic Counseling Clinical Practicum (1 cr)
- MGEN-Q715 Neurogenetics Counseling Clinical Practicum (1 cr)
- MGEN-Q716 Prenatal Genetic Counseling Clinical Practicum (1 cr)
- MGEN-Q717 Prenatal Diagnosis GC & Stillbirth Assessment Practicum (1 cr)
- MGEN-Q810 Genetic Counseling Research I (1 cr)
- MGEN-Q613 Molecular and Biochemical Genetics Laboratory (2 cr)
- MGEN-Q629 Embryology for Genetics Clinicas (2 cr)
- MGEN-Q633 Professional Issues in Genetic Counseling (1 cr)
- MGEN-Q614 Psychological Aspects of Genetic Counseling (3 cr)
- MGEN-Q634 Professional Issues in Genetic Counseling II (1 cr)
- MGEN-Q811 Genetic Counseling Research II (1 cr)

Genetic Counseling Graduate Research Project

Genetic counseling students must complete a clinical research project for which they will enroll in at least two credits of Genetic Counseling Research (MGEN-Q810, MGEN-Q811) in addition to the required 45 credit hours from courses and clinical work. In extenuating circumstances, a case report with literature review may be implemented in lieu of a clinical research project.

Final Examination

Genetic counseling MS students must pass a comprehensive written examination. Students who are unsuccessful on the written examination will be offered one opportunity to sit for an oral exam with a standardized departmental committee. Under exceptional circumstances, the student may petition the committee to be permitted to take the final examination one additional time.

Program Termination

Academic, clinical, or research deficiency will result in termination of the genetic counseling student's enrollment in the program.

Doctor of Philosophy Degree

Admission Requirements

Admission to the Medical and Molecular Genetics PhD program participates in an "open enrollment" system named The Indiana University School of Medicine BioMedical Gateway (IBMG). IBMG provides a shared first year experience for all of the School of Medicine biomedical science pre-doctoral (PhD program) students.

Students interested in direct admission into the Medical and Molecular Genetics PhD program must contact the graduate program advisor first for admissions process and eligibility. MD/PhD combined degree students must

contact the graduate program advisor and the Indiana Medical Scientist Training Program office; combined degree students must first complete Phase 1, including the USMLE Step 1 exam, as part of the IU medical school curriculum, before entering the Medical and Molecular Genetics PhD program.

Student Learning Outcomes

Students completing the PhD in Medical and Molecular Genetics will be able to:

1. Demonstrate comprehensive knowledge in medical and molecular genetics through successful completion of coursework.
2. Think critically and creatively as assessed through writing a grant proposal and defending the proposal to qualify for candidacy.
3. Document an original contribution to genetics through experimental design and implementation of an independent research plan culminating in the presentation and defense of a thesis.

Course Requirements

All PhD students are required to take a minimum of 12 hours of coursework in the major, with a grade of B or better, and the remaining hours will be of the minor, research skills, dissertation research, and seminar credits for a total of 90 credit hours at a minimum. Information on first year required courses for the open enrollment pathway (Indiana Biomedical Gateway – IBMG) may be found under the Biomedical Sciences section of this bulletin. Up to 30 credit hours of non-clinical graduate level courses may apply toward the PhD or the MD/PhD combined degree.

Required minimum 12 credit hour courses in the **Major**:

- MGEN-Q625 Introduction to Clinical Genetics (1 cr)
- MGEN-Q660 seminar (1 cr)- presentation seminar
- MGEN-Q640 Special Topics in Human Genetics (1 cr; Written, Verbal and Presentation Skill Development for Genetics)
- Student can choose from one of the following options:
 - MGEN-Q580 Basic Human Genetics (3 cr)*
 - MGEN-Q581 Introduction to Quantitative Biomedical Sciences (3 cr). If students select the Q581 option, then the following courses are recommended and are Genetics Major-eligible courses: 1) GRDM-G888 Single-Cell and Spatial Omics (2cr); and 2) GRDM-G889 Single-Cell and Spatial Omics Practical Lab (1cr)
 - *MD/PhD students can use GRDM-X630 (7 cr., after converting MED-X630 if a B grade or better) as part of the MMGE Major requirements in place of MGEN-Q580

Additional **Major** courses to reach 6 cr total can come from the list below:

- MGEN-Q610 Clinical Genetics Practicum (3 cr)
- MGEN-Q612 Mol and Biochem Genetics (3 cr)
- MGEN-Q620 Human Cytogenetics (2 cr)
- MGEN-Q630 Population Genetics (1 cr)
- GRDM-G724 Molecular Cancer Genetics (1 cr)

- GRDM-G725 Gene Therapy (1 cr)
- GRDM-G726 Developmental Genetics (1 cr); not currently active
- GRDM-G727 Animal Models of Human Disease (1 cr)
- GRDM-G716 Molecular Biology and Genetics (2 cr – Fall 2019 and later)
- GRDM-G848 Bioinform., Genomics, and Proteomics (2 cr)
- GRDM-G888 Single-Cell and Spatial Omics (2cr)
- GRDM-G889 Single-Cell and Spatial Omics Practical Lab (1cr)
- PBHL-B561 and/or PBHL-B562 (Biostatistics I and II; 3 cr each)
- MGEN-G788/ INFO I590 Next Generation Sequencing (3cr)
- INFO-B 506 Biomedical Informatics (3cr)
- INFO-B 529 Machine Learning Bioinformatics (3cr)

Additional MGEN-Q 660 Seminars (additional 3 credits):
PhD Students only need to register for MGEN-Q660 (1 cr) in the fall/spring semesters until they pass their qualifying exam and submit their eDocs, or for 4 total semesters, whichever is the latter and if they satisfied the 1 credit of MGEN-Q660 required for the Major.

Required Research Skills courses (4-6 credits):

- GRDM-G 505 THE RESPONSIBLE CONDUCT OF RESEARCH (1 cr)
- GRDM-G 507 REAGENT VALIDATION AS A MEANS FOR ENHANCED RESEARCH REPRODUCIBILITY (1cr)
- Biostatistics Course (choose one):
 - GRDM-G 855 EXPERIMENTAL DESIGN AND RESEARCH BIOSTATISTICS (1cr)
 - PBHL-B 561 INTRODUCTION TO BIOSTATISTICS I (3 cr)
 - PBHL-B 562 BIOSTATISTICS FOR PUBLIC HEALTH II (3 cr)
- Science Communication (choose one):
 - COMM-C 534 DISTILLING YOUR MESSAGE (1 cr)
 - COMM-C 533 IMPROVISATION FOR SCIENTISTS (1 cr)
 - ENG-W 533 SCIENCE WRITING FOR PUBLIC READERS (1 cr)
- General Electives: If approved by the graduate advisor, students may also *take independent of their major or minor*, electives for their research program including 500+ level non-research courses in: ANAT-* 500 to ANAT-* 899, BIOC-* 500 to BIOC-* 899, CANB-* 500 to CANB-* 899, GRDM-* 500 to GRDM-* 899, INFO-* 500 to INFO-* 899, MGEN-* 500 to MGEN-* 899, MICR-* 500 to MICR-* 899, and MNEU-* 500 to MNEU-* 899".

Dissertation Research Courses: A minimum of 40 credits of dissertation research from the following options: MGEN-Q800 Medical Genetics Research, GRDM-G803 Research, GRDM-G718 Research in Biomedical Science.

Minor

Must be chosen from an approved list for IU School of Medicine PhD students, e.g., bioinformatics, cancer

biology, cardiovascular sciences, diabetes and obesity, life sciences, health informatics, translational sciences, or another topic with the approval of the student's Advisory Committee and graduate advisor. Number of credit hours (usually 12) and grades required are determined by the minor director for each minor. Minor credits must be separate from the Department of Medical and Molecular Genetics major course credit requirements.

Qualifying Examination and Candidacy

The Qualifying Examination (QE) assesses the student's research aptitude and critical thinking necessary to complete the requirements and intellectual rigors of the PhD. The QE is composed of a detailed research proposal that is reviewed by the student's Advisory Committee and orally defended. Examination over the minor field is at the discretion of the minor field department. Students submit their nomination for candidacy eDoc upon completion of the approved plan of study and the QE. PhD candidates then submit Nomination of the Research Committee for the PhD eDoc.

Final Examination

Oral defense of dissertation with a public seminar and meeting with the student's Research Committee.

Program Termination

Research or academic deficiency, including two failures of the qualifying examination, will result in termination of the student's enrollment in the program. Students wishing to terminate the PhD with a MS non-genetic counseling degree in medical and molecular genetics must first contact the graduate advisor and the IUSM Graduate Division office (gradiusm@iu.edu) for requirements.

Ph.D. Minor in Medical and Molecular Genetics

The Genetics PhD minor involves completing 12 credit hours across a variety of courses focused on aspects of medical and molecular genetics. The required Basic Human Genetics course for this minor will cover basic genetic concepts with the student expanding their knowledge in either a life science path or informatics path. The minor incorporates some flexibility with a variety of acceptable courses to complete the minor.

Required courses

1. MGEN-Q580 – Basic Human Genetics (3 cr.)
2. At least two of the following courses:
 - GRDM-G725: Gene Transfer Approaches (1 cr.)
 - MGEN-Q625 Introduction to Clinical Genetics (1 cr.)
 - MGEN-Q620 Human Cytogenetics (2 cr.)
 - MGEN-Q630 Population Genetics (1 cr.)

**Additional minor electives
 (select from this list until the total credits for the minor reach 12 credits)**

- BIOC-B500 Introductory Biochemistry
- MGEN-Q610: Clinical Genetics Practicum (3 cr.)
- MGEN-Q612: Molecular and Biochemical Genetics (3 cr.)
- MGEN-Q613: Molecular and Biochemical Genetics Lab (2 cr.)

- MGEN-Q620: Human Cytogenetics (2 cr.)
- MGEN-Q625 Introduction to Clinical Genetics (1 cr.)
- MGEN-Q630: Population Genetics (1 cr.)
- GRDM-G715: Biochemical Basis of Biological Processes (2 cr.)
- GRDM-G716: Molecular Biology and Genetics (2 cr.)
- GRDM-G717: Cellular Basis of Systems Biology (2 cr.)
- GRDM-G 720 Stem Cell Biology (2cr)
- GRDM-G724: Molecular Cancer Genetics (1 cr.)
- GRDM-G725 Gene Transfer Approaches to Clinical and Basic Research (Gene Therapy) (1cr)
- GRDM-G727: Animal Models of Human Disease (1 cr.)
- GRDM-G788: Next Generation Sequencing (3 cr.)
- GRDM-G848: Bioinformatics, Genomics, and Proteomics (2 cr.)
- GRDM-G852: Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)
- PBHL-B561: Biostatistics I (3 cr.)
- PBHL-B562: Biostatistics II (3 cr.)
- PBHL-B571: Biostatistical Methods: Linear Models (4 cr.)

Other relevant courses may be approved by the student's minor advisor and advisory committee.

Minor Program Notes

The minor program will be approved by the student's advisory committee which will take into consideration the student's total didactic experience. The advisory committee may approve additional and/or substitution of appropriate courses to complete the degree requirements. The minor representative on this Committee will be selected from outside the student's major department.

NOTE: Courses cannot count towards both the students PhD major and PhD minor.

Admission Requirements

To be admitted to the Ph.D. minor in Medical and Molecular Genetics, you must be a currently enrolled doctoral student in good academic standing in any IU school.

Grading Policy

A minimum of B (3.0) is required in each course that is to count toward the minor. If a minimum of B (3.0) is not earned in a course, that course must be retaken. A course may be retaken only once. Students who fail to achieve the minimum grade of B (3.0) the second time they take a course will not be able to earn this Ph.D. minor.

Qualifying Exam

This Ph.D. minor does not require a Qualifying Exam.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Courses

General

- **MGEN-Q 580 Basic Human Genetics (3 cr.)**P: General genetics and consent of the instructor. An introduction to the genetics of human traits and heritable diseases. Emphasis will be on general aspects of eukaryotic genetics as it applies to humans, but some prokaryote genetics will be included for comparison.
- **MGEN-Q 581 Introduction to Quantitative Biomedical Sciences (3 cr.)** This course is designed to introduce students to diverse topics in the quantitative biomedical sciences connecting basic biology concepts with advanced quantitative methodologies. It will serve as an introductory course for students with either basic biology or computational backgrounds. The topics cover bioinformatics, medical informatics, imaging informatics, and data sciences.
- **MGEN-Q 600 Practical Prenatal Genetic Counseling (2 cr.)** P: Consent of the instructor. An introduction to prenatal genetic counseling including fundamentals of prenatal screening and testing, genetic risk assessment in the prenatal clinic, the prenatal genetic counseling session, and psychological aspects of working with prenatal patients. Recurrent pregnancy loss, infertility and assisted reproductive options are reviewed.
- **MGEN-Q 604 Genetic Counseling Communication Techniques (4 cr.)** Genetic counseling models, methods and communication skills; professional issues related to client interactions. Practice-based learning through role play, analysis of genetic counseling case studies, and other class interactions.
- **MGEN-Q 606 Foundations in Genetic Counseling (2 cr.)** Introduction to the principles and practice of genetic counseling. Topics include genetic counseling and case preparation techniques, pediatric/adult counseling, and support services.
- **MGEN-Q 608 Introduction to Genetic Counseling Research (1 cr.)**An overview of topics relevant to the development implementation, and dissemination of genetic counseling research projects. Topics will include library tools, project development, research ethics, IRB, basic statistics, and manuscript preparation. Each student will develop a research proposal.
- **MGEN-Q 609 Practical Cancer Genetic Counseling (2 cr.)** Overview of hereditary cancer syndromes, genetic risk assessment for personal and family history of cancer, genetic counseling approaches, and testing issues.
- **MGEN-Q 610 Clinical Genetics Practicum (3 cr.)** P: Consent of the instructor. Methods for obtaining medical and family histories, approaches to evaluation of individuals and families with genetic disorders, and techniques for providing genetic counseling. May be repeated once for credit.
- **MGEN-Q 611 Genetics Analysis Laboratory (1-2 cr.)** P: Consent of the instructor. (Not currently being offered.) Computer storage and retrieval of family data. Use of programs for genetic analysis. Includes analysis of twins, families of twins, and genetic linkage and segregation.
- **MGEN-Q 612 Molecular and Biochemical Genetics (3 cr.)** Molecular and biochemical aspects

of gene function in various genetic disorders. Emphasis on the DNA lesion when known, on aberrations in the metabolic pathways, and on structural defects. Discussion of hemoglobinopathies, phenylketonuria, storage diseases, and other conditions.

- **MGEN-Q 613 Molecular and Biochemical Genetics Laboratory (2 cr.)** The student will learn about many molecular and biochemical techniques for the determination of genetic markers that can be used for diagnosis, genotyping, and forensic applications. Includes discussion of variant interpretation of diagnostic test results and factors to consider in the selection of test methodology.
- **MGEN-Q 614 Psychological Aspects of Genetic Counseling (3 cr.)** P: One course in introductory or abnormal psychology. Introduction to theory and research in the field of genetic counseling. Topics include risk assessment, psychosocial assessment, and decision-making. The social, ethical, and legal aspects of the delivery of genetic services are also covered.
- **MGEN-Q 618 Practical Cardiovascular Genetic Counseling (2 cr.)** P: Consent of the instructor. Fundamentals of cardiovascular genetic counseling including recognition of cardiovascular conditions and subsequent impact on medical management; risk assessment for hereditary/familial cardiovascular conditions; and psychosocial and ethical issues pertaining to inherited cardiovascular disease. Includes genetic testing for hereditary cardiovascular disease and results interpretation and communication.
- **MGEN-Q 619 Practical Neurogenetics Genetic Counseling (1 cr.)** P: Consent of the instructor. This class introduces concepts integral to the practice of neurogenetic counseling. Topics include inheritance and presentation of inherited epilepsies, movement disorders, dementias, and muscular dystrophies among others; nervous system development and function; examination, imaging and genetic testing for neurogenetic conditions; presymptomatic testing protocols; and psychosocial issues of neurogenetic disorders.
- **MGEN-Q 620 Human Cytogenetics (2 cr.)** P: Consent of the instructor, basic genetics. Study of chromosome structure and replication, X-inactivation, meiosis, numerical and structural rearrangements in humans, and cytogenetics of malignancies.
- **MGEN-Q 621 Human Cytogenetics Laboratory (3 cr.)** P: Basic genetics, Q620, and consent of instructor. Current techniques in human cytogenetics. May be taken concurrently with Q620. *Not currently being offered.*
- **MGEN-Q 622 Cytogenetics of Malignancies (2-3 cr.)** P: Consent of instructor. This course will examine the biologic implications of cytogenetic abnormalities found in malignancies. Aberrant gene function as a result of cytogenetic abnormalities will be stressed. *Not currently being offered*
- **MGEN-Q 624 Clinical Management and Genetics of Metabolic Disease (1 cr.)** The student will gain a practical understanding of inborn errors of metabolism, the management of patients with these diseases and the genetic counseling issues that arise in the care of families with these diseases.
- **MGEN-Q 625 Introduction to Clinical Genetics (1 cr.)** This class will introduce the students to the broad areas of practice in clinical genetics, the ethical, legal, and social issues involved in the care of patients and families with genetic disorders, and the interface of clinical genetics and genetics research.
- **MGEN-Q 626 Fundamentals of Biochemical and Molecular Genetics (1 cr.)** Introduction to the concepts of molecular and biochemical genetics with emphasis on examples of pathogenesis of human disease. **Not currently being offered.**
- **MGEN-Q 627 Fundamentals of Human Cytogenetics (1 cr.)** An introduction to the principles of human cytogenetics with applications in basic genetics, including the clinical consequences of chromosomal abnormalities. **Not currently being offered.**
- **MGEN-Q 628 Fundamentals of Population Genetics (1 cr.)** Introduction to the broad areas of population genetics and gene discovery. **Not currently being offered.**
- **MGEN-Q 629 Embryology for Genetic Clinicians (2 cr.)** Normal human conception and embryonic/fetal development and factors causing birth defects.
- **MGEN-Q 630 Population Genetics (1 cr.)** P: Basic genetics. Basic probability and Bayes theorem, as applied to genetic counseling. Effects of mutation and selection on the survival of alleles in a population; consequences of consanguinity and inbreeding; methods of analysis including segregation and linkage including nonparametric methods; quantitative genetics such as twin studies, and heritability.
- **MGEN-Q 631 Quantitative Genetics (2 cr.)** P: G651 and G652 or equivalent. (Not currently being offered.) Inheritance of human quantitative traits, partitioning of phenotypic variation, estimation of genetic variance and heritability, methods of analyzing resemblance among relatives including nuclear families, twins, and half-siblings. **Not currently being offered.**
- **MGEN-Q 633 Professional Issues in Genetic Counseling I (1 cr.)** P: Consent of the instructor. Professional skills including keys to a successful genetic counseling job search, interviewing skills, communication skills, and professionalism; professional development in genetic counseling including expanded counselor roles, professional organizations and involvement, professional growth, and mentoring; and business foundations including insurance/billing, credentialing, licensing, and health systems.
- **MGEN-Q 634 Professional Issues in Genetic Counseling II (1 cr.)** P: Consent of the instructor. Professional skills including effective communication, media awareness, leadership, and clinical supervision; professional growth and development including communicating your worth, negotiation, expanded roles, effective teaching, course development, and becoming a master genetic counselor; and business foundations including

risk management and alternative service delivery models.

- **MGEN-Q 640 Special Topics in Medical and Molecular Genetics (1 cr.)** Study of advanced topics/literature not already emphasized in Q580, problem-based learning, and skills helpful for the PhD (grant writing, examination preparation).
- **MGEN-Q 642 Dermatoglyphics (2 cr.)** P: Consent of instructor. (Not currently being offered.) Formation, development, classification and variation of finger, palm, and footprint patterns (dermatoglyphics) in humans; interpretation of results of quantitative and statistical techniques utilized in the study of the inheritance of dermatoglyphic traits, variation in twins, and applications in clinical genetics.
- **MGEN-Q 660 Medical Genetics Seminar (1 cr.)** P: Basic genetics. Topics chosen from aspects of medical genetics not extensively treated elsewhere. Various phases of research in medicine from a genetic and clinical point of view. Students may receive credit during each semester of residence on the Medical Center campus.
- **MGEN-Q 710 Advanced Clinical Genetics Practicum (2 cr.)** P: Consent of the instructor. Hands-on training in clinical genetics diagnostic and counseling clinics. Students participate in providing genetic evaluation, risk assessment and counseling to patients with indications including dysmorphic features; abnormal growth; difficulties with neurological, psychological and/or intellectual functioning; family history of genetic disorders; and abnormal genetic test results.
- **MGEN-Q 711 Metabolic Genetics and Newborn Screening Clinical Practicum(1 cr.)** P: Consent of the instructor. Hands-on training in metabolic genetics outpatient clinics and inpatient settings with introduction to the roles of the multidisciplinary biochemical genetics team. Students gain experience with the newborn screening program and conditions including PKU, galactosemia, organic acid disorders, and lysosomal storage diseases, cystic fibrosis and hemoglobinopathies.
- **MGEN-Q 712 Cardiovascular Genetics Clinical Practicum(1 cr.)** P: Consent of the instructor. Covers presentation, long-term management and screening recommendations, risk assessment, genetic testing options and psychosocial issues associated with inherited cardiovascular conditions including cardiomyopathy, familial hypercholesterolemia, aortopathies and congenital heart defects. Students provide genetic counseling and follow-up in a supervised setting.
- **MGEN-Q 713 Cancer Genetic Counseling Clinical Practicum(variable, 1-2 cr.)** P: Consent of the instructor. Practicum includes presentation, long-term comprehensive management, risk assessment, genetic testing options and psychosocial issues associated with inherited oncology conditions. Students provide genetic counseling and follow-up in a supervised setting and become familiar with the genetic counselor's role in multidisciplinary tumor board meetings.
- **MGEN-Q 714 Advanced Cancer Genetic Counseling Clinical Practicum(1 cr.)** P: Consent of the instructor. This clinical practicum strengthens students' understanding of the presentation, risk assessment, genetic testing options and psychosocial issues associated with inherited oncology conditions and builds upon their basic genetic counseling skills. Students provide genetic counseling and follow-up in a supervised setting and attend multidisciplinary tumor board meetings.
- **MGEN-Q 715 Neurogenetics Clinical Practicum(1 cr.)** P: Consent of the instructor. Hands-on training in clinical neurogenetics diagnostic and counseling clinics. Students will participate in providing genetic evaluation, risk assessment and counseling to patients with indications including inherited structural brain anomalies, epilepsy syndromes, muscular dystrophies, developmental delays, autism, mitochondrial disorders, and adult-onset neurodegenerative conditions.
- **MGEN-Q 716 Prenatal Genetic Counseling Clinical Practicum(variable, 1-2 cr.)** P: Consent of the instructor. Hands-on training in prenatal genetic counseling for cell-free fetal DNA and maternal serum screenings, abnormal screening results, ultrasound anomalies, teratogens, family history of genetic conditions, recurrent miscarriage and advanced maternal age. Students provide genetic counseling, case management and follow-up in a supervised setting.
- **MGEN-Q 717 Prenatal Diagnosis Genetic Counseling and Stillbirth Assessment Clinical Practicum(1 cr.)** P: Consent of the instructor. Hands-on training in prenatal genetic counseling for a variety of prenatal and preconception indications. Students provide genetic counseling, case management and follow-up in a supervised setting. Includes working with interpreters in an Hispanic genetic counseling clinic and case assessment in a stillbirth assessment program.
- **MGEN-Q 730 Methods in Human Genetics (3 cr.)** P: Basic genetics, differential calculus, and Q630 or equivalent. Sampling methods employed in study of human genetics; methods for analysis of segregation, linkage, mutation, and selection with family data collected under various forms of ascertainment.
- **MGEN-Q 800 Medical Genetics Research (arr. cr.)**
- **MGEN-Q 810 Genetic Counseling Research I** P: Enrollment in IU Genetic Counseling Graduate Program. Covers the design and initiation of independent research, under the mentorship of geneticists, genetic counselors and research faculty affiliated with the Genetic Counseling Graduate Program, relevant to clinical genetics or the genetic counseling profession.
- **MGEN-Q 811 Genetic Counseling Research II** P: MGEN-Q 810. Completion of independent research, under the mentorship of geneticists, genetic counselors and research faculty affiliated with the Genetic Counseling Graduate Program, relevant to clinical genetics or the genetic counseling profession. Culminates in dissemination of research via a seminar presentation and manuscript preparation.

- **MGEN-G 901 Advanced Research (6 cr.)** For Ph.D. students who have at least 90 credit hours. May be taken for maximum of six semesters.

Graduate

- **GRDM-G 724 Molecular Cancer Genetics (1 cr.)**
An introduction to cancer focusing on genetics. Topics include causes and effects of chromosome instability (including centromere/telomere failures and chromosomal translocations), epigenetic changes and genetic risk factors during cancer progression.
- **GRDM-G 725 Gene Transfer Approaches to Clinical and Basic Research (Gene Therapy) (1 cr.)** A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.
- **GRDM-G 727 Animal Models of Human Disease (1 cr.)** This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal of the course is to provide a framework for students to select experimental animal models in their future research careers.
- **MGEN-G 788 Introduction to Next Generation Sequencing (3 cr.)** Understanding the basic principles of next generation sequencing technology. This includes basic biological applications, basics in data processing, statistical and informatics theories in data analysis, advantages, limitations, and assumption of different methodologies, and biological interpretation of the results. Cross-listed with INFO-I590.
- **GRDM-G888 Single-Cell and Spatial Omics (2cr)** The course focuses on single-cell analytics and spatial transcriptomics technologies, including experimental procedures, biological applications, bioinformatics processing and computational tools for data analysis. Each week will include a one-hour lecture covering the theory of the assay and analysis tools. The second hour will present a practical approach to using these technologies for biological discovery.
- **GRDM-G889 Single-Cell and Spatial Omics Practical Lab (1cr)** The course provides hands-on practice in data analysis of single-cell and spatial transcriptomics technologies, including both bioinformatics data processing and use of computational tools. The course is offered concurrently and synchronized with GRDM-G888, Single-Cell and Spatial Omics.

Medical Humanities and Health Studies

School of Liberal Arts

Departmental email: medhum@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/academics/degrees-programs/medical-humanities/index.html

Curriculum

Degrees Offered

Graduate Certificate in Medical Humanities, Doctoral Minor in Medical Humanities and Health Studies

Program Information

Medical Humanities offers an interdisciplinary course of study drawn from the humanities and social sciences disciplines in the School of Liberal Arts, as well as courses and participation of faculty from other schools. The field of Medical Humanities provides students with the qualitative humanistic and socio-cultural perspectives on health care, in contrast to the clinical/objective approach traditionally taken in biomedicine.

The science, study, and practice of medicine and health are multi-faceted in scope and impact. Many factors affect the outcome of health practice, which in turn, affect patients, families, and the greater public. This graduate program is interdisciplinary in nature and health-related in focus. It permits graduate students to study more comprehensively, and in-depth, the social, cultural, and humanistic determinants and consequences of human health, illness, and care. It takes advantage of the unique wealth of health-related graduate courses already offered by the School of Liberal Arts, the whole of which is even greater than the sum of its parts.

This program will be of great interest to students whether they go on to specialized training – i.e., in medicine, allied health professions, and graduate-level disciplinary or interdisciplinary studies – or for those entering (or continuing in) the health workforce.

Graduate Certificate in Medical Humanities

The primary goal of the Graduate Certificate in Medical Humanities (15 credit hours) is to enrich students' humanities-based education and professional development as they prepare for graduate work in the health professions, or to supplement and enrich their existing degree and/or health-related career. The program provides graduate students with the opportunity to study, in-depth, medicine, health, and illness from the perspective of such disciplines as literature, philosophy, history, and social science. Students view past, present, and future problems in health care from multiple and varied standpoints and work to resolve them using narrative, visual, ethical, historical, and social science methods. Through this approach, students gain greater insight into the human condition, the value of human life, the nature of suffering, and efforts to alleviate it.

In addition, the inclusion of the social sciences in the curriculum allows students the opportunity to focus on the investigation of the social and cultural construction of health, illness, and provision of healthcare using the tools of social science research. This includes understanding the cultural definitions of life/death and health/illness, the geographic and economic provision and constraints to medical and healthcare, the social and power structures that impact access to healthcare, and a familiarity with the analysis, application and limitations of social

science research methods. In this way, this program develops informed graduates with analytical skills, cultural awareness, and ethical sensitivity through application, evaluation, critical analysis, and synthesis.

Admission Requirements

1. Bachelor's degree and transcripts from all colleges and universities attended, with an overall undergraduate GPA of at least 3.0
2. Two letters of recommendation
3. Personal statement
4. International students must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email ia@iu.edu or call 317- 274-7000.
5. The following deadlines must be observed in order to receive consideration for admission:

March 1 - for summer and fall semester

October 15 - for spring semester

Graduate Certificate Requirements

The Medical Humanities Graduate Certificate consists of 15 credit hours of course work. Grades in all courses must be B or better.

Required courses (6 cr.)

- MHHS-M 501 The Human Condition (3 cr.)
- MHHS-M 595 Clinical Practicum in Medical Humanities (3 cr.) The Clinical Practicum must be approved by a faculty advisor prior to registration. For students currently engaged in a clinical practice, a substantial research and writing project based on their clinical practice, or an additional elective, may be substituted for the practicum. Those students will register for and enroll in the Clinical Practicum, but will not be required to undertake additional clinical time to complete the course. In either case, students will work closely with a faculty mentor to complete the practicum.
- Electives (9 cr.) Students should consult the Plan of Study for elective options. Electives courses are available in Medical Humanities, Philosophy, Communication, Sociology, History, Anthropology, and English.

Doctoral Minor

The Doctoral Minor in Medical Humanities (12 cr.) is interdisciplinary in nature and health-related focus. It gives students the opportunity to study more comprehensively, and in-depth, the social, cultural, and humanistic determinants and consequences of human health, illness, and care. The minor takes advantage of the unique wealth of health-related graduate courses already offered by the School of Liberal Arts, the whole of which is even greater than the sum of its parts.

The Ph.D. minor may be of particular interest to students getting a doctorate in a health-related non-Liberal Arts field, providing an opportunity to further round out and diversify the student's course of graduate study.

This is of enormous value to students whether they go on to specialized training – i.e., in medicine, allied health professions, and post-graduate disciplinary

or interdisciplinary studies – or for those entering (or continuing in) the health workforce.

Doctoral Minor Course Requirements

The Doctoral minor consists of 12 credit hours of course work, including a required introductory course (3 cr.), and a choice of three elective courses (9 cr.). Grades in all courses must be B or better.

Required Course

- MHHS-M 501 Medical Humanities & The Illness Experience: Exploring the Human Condition

Elective Courses- Choose 3

Electives courses are available in Medical Humanities, Philosophy, Communication, Sociology, History, Anthropology, and English.

- MHHS-M 504 Introduction to Research Ethics
- MHHS-M 520 The Culture of Mental Illness
- MHHS-M 592 Graduate Topics in Medical Humanities
- MHHS-M 598 Graduate Readings in Medical Humanities
- ANTH-A 560 Variable Topics in Anthropology
- PHIL-P 547 Foundations of Bioethics
- PHIL-P 555 Ethical and Policy Issues in International Research
- PHIL-P 696 Topics in Biomedical Ethics
- COMM-C 510 Health Provider-Consumer Communication
- COMM-C 521 Family Communication in Health Contexts
- COMM-C 592 Advanced Health Communication
- COMM-C 695 Seminar in Communication and Healthcare
- ENG-L 592 Advanced Health Communication
- HIST-H 546 History of Science, Medicine, and Technology
- SOC-R 515 Sociology of Health and Illness
- SOC-S 526 The Sociology of Human Sexuality
- SOC-S 560 Topics in Sociology
- SOC-R 585 Social Aspects of Mental Health and Mental Illness

Faculty Listing

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course descriptions

- **MHHS-M 501 The Human Condition (3 cr.)** This course is an in-depth scrutiny of the philosophy and empiricism of medical science. The nature of Medical Humanities is explored by debating issues affecting the human condition in general, and the illness experience in particular.
- **MHHS-M 504 Intro to Research Ethics (3 cr.)** Introduction to the basic concepts of research ethics. The course covers the historical development of concern with ethics in science as well as practical information needed by students working in science today. Format is lecture and discussion.

- **MHHS-M 510 Addiction Narratives (3 cr.)**
This course explores the ways in which, through literature, certain understandings of addiction are constructed, represented, and proliferated throughout our culture. We will explore the ways in which the experience of addiction is represented in various cultural forms and in specific texts. Additionally, we will look closely at the relationship between the idea of addiction and other categories such as gender, sexuality, normalcy, race and creativity. In this course we will compare various literary texts and films to see if some seem more "realistic" than others, and explore, through writing and discussion, the possibilities for why this may be so. We will consider how we as individuals and as a society are affected by various representations of addiction, and how this translates into everyday interaction with others. Are some representations dangerous? Students will explore the possibility that representation plays a significant role in our understanding of the experience of addiction and will be encouraged to think critically about the ways various media (film, popular texts, memoir, poetry, biography) affect the way we live our lives and the relationships we develop with others.
- **MHHS-M 520 Culture of Mental Illness (3 cr.)**
This course explores the ways in which our understanding of mental illness is constructed, represented, and proliferated throughout our culture, by examining text and film. We will consider how we as individuals and as a society are affected by different representations of mental illness, and how this translates into everyday interaction with others.
- **MHHS-M 525 Black Health and the Humanities (3 cr.)** Through history, social science, and speculative fiction, we examine Black Americans' historical relationships to medicine and public health, looking not only at medical exploitation, limited access to care, and the production of health disparities, but also our roles as health care professionals, healers, and advocates for health justice.
- **MHHS-M 592 Topics in Medical Humanities & Health Studies (3 cr.)** [Note: cannot be repeated if taken on the same topic as an undergraduate]
- **MHHS-M 595 Clinical Practicum in Medical Humanities (3 cr.)** The clinical practicum introduces graduate students to various aspects of clinical medicine including but not limited to doctor-patient interaction, qualitative research, ethics committee meetings and patient consultation, IRB processes, Grand Rounds, Morbidity and Mortality Conferences, Nursing, Medical Social Work and hospital chaplaincy. Please note the alternative available to students who are already engaged in clinical practice.
- **MHHS-M 598 Readings in Medical Humanities and Health Studies (3 cr.)** Focused readings on selected topics in medical humanities by arrangement with the instructor.
- **PHIL-P 547 Foundations of Bioethics (3 cr.)**
A rigorous examination of bioethical theory and practice. Stress is placed on moral and conceptual issues embedded in biomedical research, clinical practice, and social policy relating to the organization and delivery of health care.
- **PHIL-P 696 Topics in Biomedical Ethics (3 cr.)**
Topics in biomedical ethics focusing on variable issues, such as the healthcare needs of medically underserved people, responsibilities toward such groups, and evaluation of proposals to restructure the bioethical framework to rectify institutionalized injustices in research priorities and medical practice.
- **PHIL-P 555 Ethical and Policy Issues in International Research (3 cr.)** This course examines ethical and policy issues in the design and conduct of transnational research involving human participants. Topics discussed include: economic and political factors; study design; the role of ethics review committees; individual and group recruitment/informed consent; end of study responsibilities; national and international guidelines.
- **COMM-C 592 Advanced Health Communication (3 cr.)** A course designed to teach communication skills and practices related to health care, by examining health care communication theory. Topics covered range across communication levels (interpersonal, intrapersonal, group, organizational, mass media & mediated communication) within a variety of health care contexts.
- **COMM-C 510 Health Provider-Consumer Communication (3 cr.)** This course is designed to teach communication skills and practices related to health care talk, by examining transactional communication within health care contexts. Topics covered in this course focus directly upon interpersonal dialogue between health care providers and patients.
- **COMM-C 521 Family Communication in Health Contexts (3 cr.)** This interdisciplinary seminar focuses on communication involving families in health care settings, addressing significant issues for graduate/professional students who will work with families, including students in Comm. Studies, Nursing, Psychology, Social Work, Public Health, and Medicine. Topics include communication with families about health care concerns and family-patient-health provider systems.
- **COMM-C 591 Variable Topics in Health Communication (3 cr.)** Topics in Communication is a revolving topics course. The changing nature of the topic allows graduate students to explore, synthesize, and integrate knowledge of the field of communication and the particular discipline of applied communication while focusing on a single topic not otherwise addressed in the course of study.
- **COMM-C 695 Seminar in Communication and Healthcare (3 cr.)** This course offers the unique opportunity to gain insights and better understand the challenges of healthcare communication from those actively administering care and conducting medical research. The experts, who have agreed to lecturing in this seminar, include faculty and investigators in the IU School of Nursing, IU School of Medicine, the Charles Warren Fairbanks Center for Medical Ethics, Regenstrief Institute, the IU School of Dentistry, IU School of Social Work, The Center for Medical Humanities, the Center for Hispanic Health, Riley Child Development Center, researchers in women's health, mental health policies, surrogate decision-making, cellular and integrative physiology, adolescent health,

intercultural communication, and drug prevention and experts in clinical care.

- **SOC-R 585 Social Aspects Mental Health/Mental Illness (3 cr.)** This is a graduate level course which focuses on the sociology of mental illness and mental health. Provides a thorough grounding in the research issues and traditions that have characterized scholarly inquiry into mental illness in the past. Students will become familiar with public policy as it has had an impact on the treatment of mental illness and on the mentally ill themselves.
- **SOC-R 515 Sociology of Health and Illness (3 cr.)** Surveys important areas of medical sociology, focusing on social factors influencing the distribution of disease, help-seeking and health care. Topics covered include social epidemiology, the health-care professions, socialization of providers, and issues of cost and cost containment.
- **SOC-R 610 Urban Sociology (3 cr.)** Historical and contemporary causes, trends, and patterns of urbanization throughout the world. Various approaches to studying the process of urbanization, including ecological, social organizational, and political perspectives. Current developments and problems in urban planning.
- **SOC-S 526 Sociology of Human Sexuality (3 cr.)** A sociological analysis of the current perspectives in human sexuality, including abortion, alternative lifestyles, extra-marital sex, marital sex, premarital sex, sex in the arts, sex and the law, sexual dysfunction, variations in sexual behavior, and sex education.
- **SOC-S 560 Topics in Medical Sociology (3 cr.)** [Note: cannot be repeated if taken on the same topic as an undergraduate] Selected topics in social organization and social psychology, including but not limited to the sociologies of work, sex roles, education, mental illness, science, sociolinguistics, socialization, deviance, sexual patterns and variations, and small group processes.
- **ANTH-A 560 Topics in Medical Anthropology (1 – 6 cr.)** [Note: cannot be repeated if taken on the same topic as an undergraduate] A conceptual examination of selected topics in the field of anthropology.
- **ENG-L 592 Literature and Medicine** [Note: cannot be repeated if taken as an undergraduate]
- **HIST-H 546 History of Science, Medicine and Technology (3 cr.)** [Note: cannot be repeated if taken as an undergraduate] Study of topics in the history of science, medicine, and technology.

Medical Neuroscience

School of Medicine

Departmental E-mail: stark1@iu.edu

Departmental URL: medicine.iu.edu/research-centers/neurosciences/education/Medical-Neuroscience-Graduate-Program

Curriculum

Degrees Offered

Doctor of Philosophy in Medical Neuroscience

Minor in Medical Neuroscience

Program Description

The Stark Neurosciences Research Institute at the Indiana University School of Medicine in Indianapolis administers the Medical Neuroscience Graduate Program. The nationally and internationally prominent research institute, an interdepartmental and interdisciplinary entity that conducts broad-based research and provides a range of training opportunities in neuroscience, offers a environment of strong faculty-student interactions among more than 40 faculty members across basic and clinical sciences departments at the IU School of Medicine and IU Indianapolis. Students train in a state-of-the-art research building, which is adjacent to clinical neuroscience departments. This program facilitates a collaborative culture — a vital component of today's interdisciplinary nature of biomedical science research.

Graduates of the program are well-equipped for successful careers across the academic and non-academic scientific spectrum, including, but not limited to, electrophysiology, molecular biology, genomics, proteomics, stem cell research, neuroimaging, behavioral neuroscience, computational neuroscience, drug development, and public policy. Stark Neurosciences Research Institute houses research groups focused broadly on the biology of the nervous system with a focus on its disorders, disease, injury and repair. These programs have an emphasis on translation of basic science advances into new therapies.

Admission Requirements

The Medical Neuroscience Graduate Program works in conjunction with the Indiana Biomedical Gateway (IBMG) program, which consists of a shared first-year experience for all biomedical science PhD students. Students enter the full MedNeuro curriculum during the second year of the program.

PROGRAM STUDENT LEARNING OUTCOMES

1. Demonstrate comprehensive knowledge of the foundations of neuroscience via successful completion of the written and oral qualification examination.
2. Apply neuroscience knowledge and skills in the design, implementation, analysis, interpretation, and communication of original research and scholarship in neuroscience research.
3. Critically and creatively solve research problems, resulting in the generation of new knowledge in the field of neuroscience research.
4. Conduct neuroscience research in an ethical and responsible manner.
5. Document an original contribution to neuroscience through peer-reviewed publication of results, and presentation and defense of a thesis.

PROGRAM REQUIREMENTS

A total of 90 credit hours, including dissertation.

Minor

At least twelve (12) credit hours must be taken to fulfill minor requirements in one of the following programs: bioinformatics, biostatistics, cancer/cancer biology,

cardiovascular sciences, clinical research, communicating science, diabetes and obesity, health informatics, life sciences, policy analysis for biomedical sciences, therapeutic development and translation, and biomedical science teaching and learning. Details for each minor are at medicine.iu.edu/graduate-degrees/phd/indianapolis/curriculum. The Medical Neuroscience Education Coordinator will assist the student in fulfilling the chosen minor requirements.

Qualifying Examination

Written and oral.

Final Examination

Oral defense of written dissertation.

Program-specific Requirements

Students are expected to be continually progressing to confirmation of Ph.D. This requires reaching candidacy, compiling dissertation worthy content (as determined by research committee), writing and defending dissertation and meeting all additional programmatic requirements, including creation of IDP with major advisor, an oral scientific presentation, and a peer-reviewed first authored publication consisting of original data.

Degree Course Requirements

Major Requirements (10-12 credits):

- GRDM-G780 – Foundations of Neuroscience (6 cr)
- GRDM-G505 – Responsible Conduct of Research (1 cr)
- PHAR-F 850- Experimental Design and Grant Writing in Pharmacology and Toxicology (1 cr)

Science Communication

- COMM-C 534 Distilling Your Message
- COMM-C 533 Improvisation for Scientists
- ENG-W 533 Science Writing for Public Readers

Statistics Course (choose one, 1-3 cr)

- PSY-I 600 Statistical inference (3 cr)
- PBHL-B 561 Intro to Biostatistics I (3 cr)
- INFO-B 519 Intro to Bioinformatics (3 cr)
- GRDM-G 855 Exp Design and Research Biostats (1 cr)

Required Seminar: MNEU-N 801 (Minimum of 4 credits)

- MNEU-N801 – Seminar - Topics in Medical Neurobiology (1 cr)

Electives (fulfill any; at least 5 credits in total)

- ANAT-D 527 Neuroanatomy: Contemporary and Translational
- GRDM-G 848 Bioinformatics, Genomics, Proteomics, and Systems Biology
- PHAR-G 751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction
- GRDM-G 745 Fundamentals of Intracellular Signal Transduction
- GRDM-G 761 Molecular and Cellular Physiology of Ion Transport

- GRDM-G 817 Molecular Basis of Cell Structure Function
- GRDM-G 720 Stem Cell Biology
- GRDM-G 727 Animal Models of Human Disease
- GRDM-G 725 Gene Transfer Approaches to Clinical and Basic Research (Gene Therapy)
- BIOL-I 544 Sensory Systems
- BIOL-I 560 Clinical and Molecular Aspects of Neurodegenerative Diseases
- BIOL-I 568 Regenerative Biology and Medicine
- BIOL-I 571 Developmental Neurobiology
- BIOL-I 573 Stem Cell Biology
- PSY-I 518 Memory and Cognition
- PSY-I 615 Introduction to Behavioral Neuroscience
- PSY-I 622 Animal Learning
- PSY-I 535 Developmental Neuroscience
- PSY-I 545 Psychopharmacology
- PSY-I 650 Developmental Psychology

Research Courses (at least 60 credits in total)

MNEU-N800 – Research in Medical Neuroscience (variable credits)

NOTE 1: Students who participated in the IBMG Program for PhD Study may apply **GRDM-G718: Research in Biomedical Science** towards their research credit total (2 credits each; taken three times for a total of six credits)

NOTE 2: Students who participated in the combined MD/PhD program may apply **GRDM-G803: Research** towards their research credit total (3 credits; taken three times for a total of nine credits)

MEDICAL NEUROSCIENCE MINOR

Students in other IUSM/IU Indianapolis graduate programs may select a minor in Medical Neuroscience. The Medical Neuroscience minor consists of 12 credit hours. A minimum of 6 credit hours must be neuroscience-focused courses, including, but not limited to, neuroscience courses supported by the Medical Neuroscience Program, as well as other neuroscience and brain-related courses offered within IUSM and IU Indianapolis. There are no required courses. However, students without any didactic neuroscience exposure are strongly encouraged to take GRDM-G780. Students will work with the Co-Directors and the Education Coordinator to ensure the course content aligns well with the research interests of the student.

As new neuroscience courses become available, they may be considered for credit toward the minor. The Medical Neuroscience Training and Advisory Committee must approve any additional courses not present on this list. Courses used for a student's PhD minor cannot also be used towards the PhD major, and vice versa.

- GRDM-G780 Foundations of Neuroscience (6 cr.)
- GRDM-G743 Fundamental Neuroscience I: Electrical Signaling and Ion Channel Biology (2 cr)
- MNEU-N880 Advanced Topics in Medical Neuroscience Courses (2 cr ea.). Currently available sections:
 - Principles of Neuroimmunology
 - Experimental Methods and Animal Models for Neuroscience Disorders
 - Synaptic Plasticity in the Central Nervous System

- Molecular Bases and Pathogenesis of Neurodegenerative Diseases
- ANAT-D527 Neuroanatomy: Contemporary and Translational (3 cr)
- GRDM-G745 Fundamentals of Intracellular Signal Transduction (1-2 cr)
- BIOL-544 Sensory systems (3 cr)
- BIOL-560 Clinical and molecular aspects of neurodegenerative diseases (3 cr)
- BIOL-571 Developmental neurobiology (3 cr)
- PSY-I 518 Memory & cognition (3 cr)
- PSY-I 615 Introduction to behavioral neuroscience (3 cr)
- PSY-I 622 Animal learning (3 cr)
- PSY-I 535 Clinical neuroscience (3 cr)
- PSY-I 545 Psychopharmacology (3 cr)
- PSY-I 650 Developmental psychology (3 cr)
- GRDM-G715 Biomedical Science I. Biochemical Basis of Biological Processes (2 cr)
- GRDM-G716 Biomedical Science II. Molecular Biology and Genetics (2 cr)
- GRDM-G717 Biomedical Science III. Cellular Basis of Systems Biology (2 cr)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **ANAT-D 527 Neuroanatomy: Contemporary and Translational (3 cr):** This is an introductory course in Neuro-anatomy designed to introduce graduate students to the concepts, terminology, and basic structure of Neuro-anatomy. Emphasis will be on providing a fundamental working knowledge of the structure and function of the central and peripheral nervous system.
- **PHAR-G 751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr):** This course is designed to give graduate students in biological sciences a state-of-the-art education in cellular signaling mechanisms and the methodology used to study them. Landmark and breaking scientific journal articles in various signaling fields will be discussed and critically evaluated. Emphasis is given to experimental design and results interpretation.
- **PHAR-F 850 Experimental Design and Grant Writing in Pharmacology and Toxicology (1 cr)-** Will prepare students for the preparation of an "NIH style" grant proposal, such as that used for NRSA predoctoral fellowship grant. Students will learn how to formulate and present hypotheses, specific aims, and research plans. Students will develop a mini grant proposal and participate in a mock study section.
- **GRDM-G 505 Responsible Conduct of Research (1 cr)-** An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.
- **GRDM-G715 Biomedical Science I. Biochemical Basis of Biological Processes (2 cr)-** One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.
- **GRDM-G716 Biomedical Science II. Molecular Biology and Genetics (2 cr)-** Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.
- **GRDM-G717 Biomedical Science III. Cellular Basis of Systems Biology (2 cr)-** Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.
- **GRDM-G 720 Stem Cell Biology (2 cr)-** This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external other external stimuli, and what their clinical capabilities are and might be.
- **GRDM-G 725 Gene Transfer Approaches to Clinical and Basic Research (Gene Therapy) (1 cr)-** A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.
- **GRDM-G 727 Animal Models of Human Disease (1 cr)-** This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal of the course is to provide a framework for students to select experimental animal models in their future research careers.
- **GRDM-G 743 Fundamental Neuroscience I: Electrical Signaling and Ion Channel Biology (2 cr)-** Experimental basis for cellular and molecular concepts of electrical excitability and membrane transportation through ion channels. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide current facts to memories.

- **GRDM-G 745 Fundamentals of Intracellular Signal Transduction (1 cr)**- Experimental basis for cellular and molecular concepts of intracellular signaling cascades activated by multiple processes. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide "facts" to memorize.
- **GRDM-G 761 Molecular and Cellular Physiology of Ion Transport (1 cr)**- Advanced ion transport topics selected from current research on channels, pumps, and exchangers. Topics include transporter biophysical characteristics, long-term regulation, and electrophysiological and optical methods for study.
- **GRDM-G 780 Foundations of Neuroscience (6 cr)**- This course provides an introduction to the nervous system and its disorders. The course will provide a broad-based introduction to the structure of the nervous system, its cellular composition and mechanisms through which neurons communicate and regulate behavior and cognition. The course incorporates an in-depth analysis of the current literature.
- **GRDM-G 817 Molecular Basis of Cell Structure Function (2 cr)**- Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.
- **GRDM-G 848 Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr)**- Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.
- **GRDM-G 855 Experimental Design and Research Biostats (1 cr)**- This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.
- **BIOL-I 544 Sensory Systems (3 cr)**- The goal of Sensory Systems is to gain an understanding of the mechanisms that underlie sensory perception at the molecular, cellular, and systems level. This will be accomplished by examining how various forms of energy are transduced into the electrochemical messages of the nervous system, what pathways the information travels within the nervous system, and how this information is processed and perceived.
- **BIOL-I 560 Clinical and Molecular Aspects of Neurodegenerative Diseases (3 cr)**- This course focuses on the molecular and clinical aspects of neurodegenerative diseases. The first part of the course will briefly introduce critical brain structures, with a focus on neurons and glia and will evaluate molecular mechanisms that underlie protein aggregation and cell death. The remainder of the course will focus on the multiple aspects of specific neurodegenerative diseases.
- **BIOL-I 568 Regenerative Biology and Medicine (3 cr)**- Examines the mechanisms of natural regeneration (regenerative biology) and the application of these mechanisms to the development of therapies to restore tissues damaged by injury or disease (regenerative medicine).
- **BIOL-I 571 Developmental Neurobiology (3 cr)**- The major phases of nervous system development beginning with neuroulation and neurogenesis and ending with the onset of physiological activity will be studied in a variety of animals, mainly avians and mammals (including man). Neural developmental disorders and behavioral ontogeny will also be considered.
- **BIOL-I 573 Stem Cell Biology (3 cr)**- In this course, students will develop a clear understanding of stem cells' defining features, activities and potential utility. Stem cell research is pursued in nearly all areas of medicine. This course focuses on important definitions and characteristics of stem cells and develops a general overview of stem cell biology. The course builds on this overview of stem cell biology by examining specific examples of developmental biology, methodology and the potential applications of stem cell therapy.
- **COMM-C 533 Improvisation for Scientists (1 cr)**- Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.
- **COMM-C 534 Distilling Your Message (1 cr)**- Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.
- **ENG-W 533 Science Writing for Public Readers (1 cr)**- With an emphasis on shorter forms of writing, students discover voices, messages, and forms appropriate for bringing scientific expertise to non-science readers. They practice processes of response, revision, and editing to shape presentations for various readers, contexts, and paths of publication.
- **INFO-B 519 Intro to Bioinformatics (3 cr)**- Sequence alignment and assembly; RNA structure, protein and molecular modeling; genomics and proteomics; gene prediction; phylogenetic analysis; information and machine learning; visual and graphical analysis bioinformatics; worldwide biologic databases; experimental design and data collection techniques; scientific and statistical data analysis; database and data mining methods; and network and Internet methods.
- **PBHL-B 561 Intro to Biostatistics I (3 cr)**- This course introduces the basic principles and methods of data analysis in public health biostatistics. Emphasis is placed on public health concepts such as sampling, study design, descriptive statistics, probability, statistical distributions, estimation,

hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation. SAS software is required.

- **PSY-I 518 Memory and Cognition (3 cr)- A** survey of theories and research concerned with processes in the acquisition, storage, and retrieval of information, as well as selected additional topics in cognitive psychology.
- **PSY-I 535 Developmental Neuroscience (3 cr)-** Course will examine the nature of how biological and developmental alterations lead to aberrant behaviors that define psychopathology. Course covers theories of development and neuroscience, including methods of study. Discussion of the ethics involved in the field of Developmental Neuroscience.
- **PSY-I 545 Psychopharmacology (3 cr)- A** survey of the effects of drugs on behavior, cognitive functioning and emotions. Emphasis will be placed on the practical advantages of understanding how psychotropic drugs work, and on how the brain functions in health and disease. Students will be exposed to the most current theories and research in the field.
- **PSY-I 600 Statistical inference (3 cr)-** Emphasis is given to principles underlying both parametric and nonparametric inference.
- **PSY-I 615 Introduction to Behavioral Neuroscience (3 cr)- A** survey of the integrated neurosciences emphasizing physiological psychology. Neural processes of sensory and motor function, arousal and sleep, motivation, learning and memory, language function, and personality disorders will be presented with selected coverage of neuroanatomy, neurophysiology, neuropharmacology, and neuroendocrinology. Both normal and pathological functions will be covered.
- **PSY-I 622 Animal Learning (3 cr)- A** survey of the methods, problems, and research in Pavlovian, instrumental, and operant conditioning. Current issues and attempts at theoretical integration are highlighted. Emphasis is also given to the empirical and conceptual foundations underlying the present views on the mechanisms governing learned behavior.
- **PSY-I 650 Developmental Psychology (3 cr)-** Major concepts, principles, and facts concerning the biological and environmental influences on behavioral and psychological development. Particular emphasis given to essential principles of ontogenetic development (life span) emerging from current research in genetics and psychology.
- **MNEU-N 880 Advanced Topics in Medical Neuroscience Courses (1-3 cr)- This** advanced topics course will focus on research-specific areas of medical neuroscience to enhance the knowledge and skills of students. Examples of possible course themes include (but are not limited to): neuroimmunology; experimental methods and animal models for neuroscience disorders; neurobiology of nervous system injury and repair; addictions neuroscience; neurodegenerative disorders; pain disorders; neuroimaging; and neurobiology of psychiatric disorders.
- **MNEU-N801 – Seminar - Topics in Medical Neurobiology (1 cr)-** Recent topics in medical

neurobiology covered by literature and research reports and discussions by faculty, graduate students and invited guest lecturers.

Microbiology and Immunology

School of Medicine

Departmental E-mail: mkaplan2@iu.edu

Departmental URL: medicine.iu.edu/microbiology-immunology

Curriculum

Degrees Offered

Doctor of Philosophy in Microbiology and Immunology (Ph.D.), Microbiology and Immunology, Ph.D. minor

Program Information

The Department of Microbiology and Immunology at IU School of Medicine offers Master of Science and PhD degree programs in Microbiology and Immunology as well as a PhD Minor in Microbiology and Immunology.

Common to all programs is an introduction to both the human immune system and microbial pathogenesis as well as advanced course work in both areas, with flexibility to accommodate a broad range of student research interests. Both the MS and PhD degree programs emphasize immersive research experiences to prepare students for productive careers as research scientists, as faculty, or in other leadership positions in their chosen fields.

Admission Requirements

See IBMG requirements.

Program Student Learning Outcomes

Doctor of Philosophy in Microbiology and Immunology (Ph.D.)

Students completing the Ph.D. in Microbiology and Immunology will be able to:

1. Conduct independent research under the supervision of a research advisor to address a relevant hypothesis in an area of microbiology and immunology.
2. Assess the quality and relevance of primary literature and incorporate into research design.
3. Employ rigorous and ethical approaches to data collection, replication of experimental results, set up of experimental controls and sampling design, organization of raw data, and application of appropriate statistics.
4. Analyze data, interpret results, and draw conclusions from data.
5. Communicate research hypotheses and results effectively in oral presentations.
6. Document an original contribution to microbiology and immunology through independent experimental design, submission of results to a peer-reviewed journal, and presentation and defense of a

dissertation of original research in an area of microbiology and immunology.

Doctor of Philosophy Degree in Microbiology and Immunology

Focus Areas

The major focus areas are cellular and molecular immunology and hematology and molecular microbial pathogenesis. Students entering the program may design a course of study from one of these areas through a combination of selected course work and research activities.

Degree Course Requirements

A total of 90 credit hours, of which a minimum of 26 credit hours must be in courses other than dissertation research. Of these, at least 12 credits will be taken in a minor of the student's choosing, and at least 14 credits of course work is required to complete the Microbiology and Immunology major.

Required didactic courses for the Microbiology and Immunology Major (at least 14 cr total):

- Laboratory rotations (at least 3 credits)
 - GRDM-G 718 – Research in Biomedical Science
 - GRDM-G 803 – Research
 - MICR-J 802 – Introduction to Research
- Spring module courses (2 cr total)
 - GRDM-G 728 Fundamentals of Infection and Pathogenesis (1 cr)
 - GRDM-G 729 Immunology I: Introduction to the Immune System (1 cr)
 - Students who have taken MED-X 650 are not required to take either of these courses.
- Advanced courses (2 cr total)
 - MICR-J 807 – Current Topics in Immunology
 - MICR-J 815 – Current Topics in Viral Immunology
 - MICR-J 829 – Current Topics in Molecular Genetics of Microorganisms
- Dissertation Research (at least 40 cr)
 - MICR-J 810
- Elective Courses
 - Core & Foundations:
 - GRDM-G 505 – The Responsible Conduct of Research
 - GRDM-G 507 – Reagent Validation as a Means for Enhanced Research Reproducibility
 - GRDM-G 700 – Translating Foundational Science to Contemporary Knowledge
 - GRDM-G 702 – Entering Biomedical Research
 - GRDM-G 715 – Biomedical Science I: Biochemical Basis of Biological Processes
 - GRDM-G 716 – Biomedical Science II: Molecular Biology and Genetics
 - GRDM-G 717 – Biomedical Science III: Cellular Basis of Systems Biology
 - GRDM-G 855 – Experimental Design and Research Biostatistics
- Specialized Biomedical Courses:
 - GRDM-G 720 – Stem Cell Biology
 - GRDM-G 852 – Concepts of Cancer Biology: Signaling Gone Awry
- Professional & Communication:
 - PHAR-F 850 – Experimental Design and Grant Writing in Pharmacology and Toxicology
 - ENG-W 533 – Science Writing for Public Readers
 - COMM-C 533 – Improvisation for Scientists
 - COMM-C 534 – Distilling Your Message
- Microbiology Advanced Topics:
 - MICR-J 807 – Current Topics in Immunology
 - MICR-J 815 – Current Topics in Viral Immunology
 - MICR-J 829 – Current Topics in Molecular Genetics of Microorganisms
- Systems/Integrated Biomedical Courses:
 - GRDM-X 620 – Human Structure
 - GRDM-X 630 – Molecules to Cells and Tissues
 - GRDM-X 640 – Fundamentals of Health and Disease
 - GRDM-X 660 – Neuroscience and Behavior

General Elective courses (take up to 24 cr)

- Non-research courses at the 500+ level in any of the following disciplines may count toward the PhD degree:
 - ANAT-*500 to ANAT-*899
 - BIOC-*500 to BIOC-*899
 - CANB-*500 to CANB-*899
 - GRDM-*500 to GRDM-*899
 - INFO-*500 to INFO-*899
 - MGEN-*500 to MGEN-*899
 - MICR-*500 to MICR-*899
 - MNEU-*500 to MNEU-*899
 - PBHL-*500 to PBHL-*899
 - PHAR-*500 to PHAR-*899

Degree Plan of Study

Year 1 Fall (11 cr)

- Laboratory Rotation (from among GRDM-G 718, GRDM-G 803, MICR-J 802)
- Elective courses
- Minor Requirements

Year 1 Spring (12 cr)

- Laboratory Rotations (from among GRDM-G 718, GRDM-G 803, MICR-J 802)
- GRDM-G 728 Fundamentals of infection and Pathogenesis

- GRDM-G 729 Immunology I-Introduction to the Immune System
- Elective courses
- Minor Requirements

Year 1 Summer (6 cr)

- Dissertation Research
- Elective courses
- Laboratory Rotations

Year 2 Fall (10 cr)

- Dissertation Research
- Minor Requirements
- Elective courses

Year 2 Spring (10 cr)

- Dissertation Research
- Minor Requirements
- Elective courses

Year 2 Summer (6 cr)

- Dissertation Research

Year 3 Fall (10 cr)

- Dissertation Research

Year 3 Spring (10 cr)

- Dissertation Research

Year 3 Summer (6 cr)

- Dissertation Research

Year 4 Fall (10 cr)

- Dissertation Research

Year 4 Spring (6 cr)

- Dissertation Research

Year 4 Summer (6 cr)

- Dissertation Research

Year 5 Fall (6 cr)

- Dissertation Research

Year 5 Spring (6 cr)

- Dissertation Research

Grades

An overall average of at least a B (3.0). Only 3 credits of C (2.0) can be counted toward the required credits of didactic coursework.

Minor

Students must complete a minimum of 12 credit hours in a minor area of study. Microbiology and Immunology PhD students may take any minor plan of study at IU Indianapolis or may utilize an individualized minor, in consultation with their mentor and Advisory Committee. Specific minor programs may require or allow some of the courses listed above. If a course is taken for a minor, that course cannot also count toward the major; no course can count toward both the major and the minor.

Qualifying Examination

Within the first 25 months of studies (18 months for combined M.D./Ph.D.), the student submits a written research proposal in the form of a grant application to the advisory committee. The student then has an oral examination administered by the advisory committee and based primarily on the written research proposal. With consent of the advisory committee, the student can be granted an extension of four months from the faculty to take the qualifying examination. Doctoral studies are continued if the qualifying examination and other work, including research, are deemed satisfactory by the majority of the advisory and research committees.

Dissertation Research

Beyond didactic course work, students will enroll in GRDM-J 810 Research in Microbiology to complete the 90-credit minimum requirement. Students must complete at least 40 credits of J810.

Timeline / Milestones

Years 1-2: complete non-research course work to fulfill the Microbiology and Immunology major and the selected Minor program. Students in good academic standing may use the 3rd year to complete didactic course requirements.

Year 3: Students complete Qualifying Examination and Advance to PhD Candidacy

Year 3: Research Committee is appointed for the PhD candidate.

Years 3-5: Students complete dissertation research.

Year 5: Dissertation Defense Announcement submitted.

Year 5: Students complete dissertation defense examination.

Year 5: Students complete remaining requirements for the PhD degree.

Final Examination

Oral defense of the dissertation.

Other Requirements

In addition to course work and research, students will attend the weekly departmental seminar series, participate in a journal club in their area of study, and attend and, starting in their second year, annually present research at the weekly departmental Research in Progress (RIP) student seminar series.

Submission of a manuscript based on the dissertation research for publication in a primary journal in the field is required.

It is the policy of the Department that all requirements of the degree program must be completed and the final, approved thesis deposited with the Graduate School within 5 years of the date of passing the Qualifying Examination. Failure to complete the degree within 5 years of passing the Qualifying Exam will result in dismissal from the program.

PhD Minors Offered

Ph.D. Minor in Microbiology and Immunology

This minor is open to all Ph.D. students at Indiana University, except those within the IU School of Medicine whose major is Microbiology and Immunology.

Students completing the 12-credit Minor in Microbiology and Immunology will take both of the following introductory courses: G728 Fundamental Concepts of Infection and Pathogenesis (1 cr.) and G729 Introduction to Immunological Systems (1 cr.), and students will take at least two of the following advanced courses in Immunology or Microbiology: J807 Current Topics in Immunology (2 cr.), J815 Current Topics in Viral Immunology, and J829 Current Topics in Molecular Genetics of Microorganisms (2 cr.). If both advanced courses are taken, the third course may be applied to the Minor Electives category (see below).

Required courses (6 cr total):

- GRDM-G 728 (1 cr): Fundamentals of Infection and Pathogenesis
- GRDM-G 729 (1 cr) Immunology I- Introduction to the Immune System
- Advanced Microbiology and Immunology Courses (**choose 2**) (4 cr total)
 - MICR-J 807 Current Topics in Immunology
 - MICR-J 815 Current Topics in Viral Immunology
 - MICR-J 829 Current Topics in Molecular Genetics of Microorganisms
 - GRDM-G 720 Stem Cell Biology
- Elective Courses (6 cr total):
 - MICR-J 710 Practical Training in Teaching Clinical Microbiology and Immunology
 - MICR-J 800 Advanced Microbiology
 - MICR-J 807 Current Topics in Immunology
 - MICR-J 815 Current Topics in Viral Immunology
 - MICR-J 829 Current Topics in Molecular Genetics of Microorganisms
 - GRDM-G 505 The Responsible Conduct of Research
 - GRDM-G 715 Biomedical Science I - Biochemical Basis of Biological Processes
 - GRDM-G 716 Biomedical Science II - Molecular Biology and Genetics
 - GRDM-G 717 Biomedical Science III: Cellular Basis of Systems Biology
 - GRDM-G 720 Stem Cell Biology
 - GRDM-G 724 Molecular Cancer Genetics
 - GRDM-G 725 Gene Transfer Approaches to Clinical and Basic Research (Gene Therapy)
 - GRDM-G 727 Animal Models of Human Disease
 - GRDM-G 747 Principles of Pharmacology
 - GRDM-G 780 Foundations of Neuroscience
 - GRDM-G 805 Diabetes and Obesity
 - GRDM-G 817 Molecular Basis of Cell Structure Function
 - GRDM-G 848 Bioinformatics, Genomics, Proteomics, and Systems Biology

- GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry
- GRDM-G 855 Experimental Design and Research Biostatistics
- MNEU-N 880 Advanced Topics in Medical Neuroscience

Additional courses may be used or substituted with the approval of the Department of Microbiology and Immunology Graduate Advisor.

No course with a grade below B- may count toward the minor.

Minor Representative: Any faculty member with a primary or secondary appointment within the Department of Microbiology and Immunology may serve as the minor representative for students completing the Microbiology and Immunology minor. The minor representative will approve the course work for this minor based on the student's interests.

PhD Minor in Microbiology and Immunology Plan of Study

Year 1 Fall:

- Elective courses

Year 1 Spring:

- Elective courses
- GRDM-G 728
- GRDM-G 729

Year 2 Fall:

- Elective courses
- Advanced Microbiology and Immunology courses

Year 2 Spring

- Advanced Microbiology and Immunology courses

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Courses Descriptions

MICR-J 510 Infectious Microbes and Host Interactions (3 cr.): Emphasis on the molecular and cellular events which permit pathogenic bacteria and viruses to enter human cells and disrupt cell function while evading the host's immune system.

MICR-J 610 Medical Immunology (2 cr.): Introduction to natural and acquired immune mechanisms, with consideration of their significance to medicine. Topics will include both normal and abnormal immune processes, including recovery from and prevention of disease, immune-mediated pathological processes, tumor immunology, immunodeficiency, and auto-immunity. Designed to precede and complement J602 Medical Microbiology. Department is not currently offering this course.

MICR-J 710 Practical Training in Teaching Clinical Microbiology and Immunology (1 cr.): This course provides practical training in teaching the fundamentals

and clinical applications of microbiology and immunology for nursing and other health pre-professional students.

Students will be introduced to educational concepts, including curriculum design and delivery, and will receive hands-on experience teaching undergraduate-level microbiology and immunology with clinical applications.

MICR-J 800 Advanced Microbiology (arr cr.): The approach to problems in microbiology including the application of techniques of bacteriology, genetics, immunology, mycology, parasitology, virology, and zoology.

MICR-J 802 Introduction to Research (2 cr.): Laboratory research instruction in microbiology and immunology. Purpose is to introduce students to three different research programs in microbiology and/or immunology.

MICR-J 805 Molecular Immunology (3 cr.): Characterization of immunologically relevant molecules in terms of molecular genetics, synthesis and assembly, structure-function and evolutionary relationships, and functional roles in immune responses. Entities to be considered include members of the immunoglobulin superfamily and functionally associated molecules.

MICR-J 806 Immunochemistry: Laboratory (arr cr.): P: J805. C. Antigen preparation; separation and purification of antibodies; modern methods of antibody determination and analysis. Department is not currently offering this course.

MICR-J 807 Current Topics in Immunology (2 cr.): Discussion and review of current literature in selected topics in immunology. Emphasis on molecular and cellular events in lymphocyte activation and regulation. Topic varies from year to year.

MICR-J 810 Research in Microbiology (arr cr.): Data obtained in this course may be used to meet the thesis requirements for graduate degrees. These courses are eligible for a deferred grade.

GRDM-G 505 Responsible Conduct of Research (1 cr.): An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 507 Reagent Validation for Research Reproducibility (1 cr.): "Reagent Validation as a Means for Enhanced Research Reproducibility" is designed to provide training for pre-doctoral students in the area of appropriate reagent utilization by focusing on biological variables, with particular attention to murine models, and on biological and chemical resources, with particular attention to cell line authentication, plasmid verification, and antibody utilization. This course will entail a traditional didactic lecture series accompanied by relevant whole-class practical exercises allowing students to implement basic methods of reagent verification.

GRDM-G 700 Translating Foundational Science to Contemporary Knowledge (1 cr.): G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then

through discussion of an assigned paper from the primary literature.

GRDM-G 702 Entering Biomedical Research (1 cr.): This mentee training curriculum is designed for first year graduate students to get the most from their mentored research experience. Group activities, case studies and facilitated discussion, are used to cover topics and concepts organized to develop their research skills, interpersonal skills, psychosocial skills, professionalism skills, and group dynamic skills.

GRDM-G 715 Biomedical Science I (2 cr.): One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G 716 Biomedical Science II (2 cr.): Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G 717 Biomedical Science III (2 cr.): Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G 718 Research in Biomedical Science (1-4 cr.): A laboratory research rotation course. Allows incoming basic science doctoral graduate students in the School of Medicine programs to take research rotation in laboratories affiliated with all of the School graduate programs.

GRDM-G 720 Stem Cell Biology (2 cr.): This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external other external stimuli, and what their clinical capabilities are and might be.

GRDM-G 728 Fundamentals of Infection and Pathogenesis (1 cr.): This course will cover concepts of host-pathogen interactions ranging from pathogen entry, growth and spread in the host to pathogen and mediated injury, immune evasion, pathogen survival strategies and transmission to new hosts. Basics of bacterial, viral and parasitic structures will be considered as they relate to pathogenesis.

GRDM-G 729 Immunology I: Introduction to the Immune System (1 cr.): An introductory biomedical science, lecture-based core course intended for all incoming basic science graduate doctoral students in the School of Medicine programs or other interested graduate students. The course will cover components of

the immune system development of the immune system, the immune response to pathogens and immunological disease.

GRDM-G 803 Research (1-4 cr.): Mentored research for MD/PhD students.

GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.): Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G 855 Experimental Design and Research Biostatistics (1 cr.): This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

GRDM-X 620 Human Structure (9 cr.): The Human Structure course is designed to provide students an integrated microscopic-to-macroscopic understanding of the structural organization underlying many of the functions of the human body. In addition students are exposed to the developmental processes responsible for the unique structural and spatial relationships associated with the various organ systems of the body. On completion students will have a sound framework of anatomical knowledge on which to build their future understanding of disease and treatment.

GRDM-X 630 Molecules to Cells and Tissues (7 cr.): The overarching goal of Molecules to Cells and Tissues (MCT) is to integrate the biochemistry, genetics, and cell and molecular biology underlying normal cell structure and function as it relates to disease pathogenesis.

GRDM-X 640 Fundamentals of Health and Disease (6 cr.): Students' knowledge of physiological, pathophysiological and pharmacological principles will enable them to describe maintenance of normal physiologic functions and discuss disease states and drug treatments in terms of altered cellular and tissue function.

GRDM-X 650 Host Defense (6 cr.): The goal of Host Defense is to enhance students' knowledge of the immune system and the pathogenesis of infectious organisms while enabling them to formulate appropriate diagnostic and interventional strategies for the prevention and treatment of infectious diseases and immune-mediated pathologies.

GRDM-X 660 Neuroscience and Behavior (6 cr.): Neuroscience and Behavior provides a comprehensive introduction to the structure, function, and disorders of the human nervous system. Using an organ system based approach, this highly multidisciplinary course integrates a strong foundational basic science framework (neuroanatomy, systems neurophysiology, neuroembryology, neuropharmacology and neuropathology) with clinical neurology and psychiatry. Students will acquire the knowledge and problem solving skills necessary to diagnose, describe, and identify treatments for patients with a broad range of acquired and congenital neurologic and psychiatric diseases, syndromes, and pathologies commonly diagnose.

MICR-G 837 Mammalian DNA Repair and Disease (3 cr.): The molecular biology of DNA repair pathways; emphasis on mammalian DNA repair systems and their relevance in human cancer and genetic diseases.

PHAR-F 850 Experimental Design and Grant Writing (1 cr.): Will prepare students for the preparation of an "NIH style" grant proposal, such as that used for NRSA predoctoral fellowship grant. Students will learn how to formulate and present hypotheses, specific aims, and research plans. Students will develop a mini grant proposal and participate in a mock study section.

ENG-W 533 Science Writing for Public Readers (1 cr.): With an emphasis on shorter forms of writing, students discover voices, messages, and forms appropriate for bringing scientific expertise to non-science readers. They practice processes of response, revision, and editing to shape presentations for various readers, contexts, and paths of publication.

COMM-C 533 Improvisation for Scientists (1 cr.): Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 Distilling Your Message (1 cr.): Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

*These courses are eligible for a deferred grade.

MICR-J 815 Current Topics in Viral Immunology (2 cr.): This course is designed to teach students historical and cutting-edge concepts in the study of immune responses to viral infections. Faculty members will lecture on the assigned topics and will lead a discussion of related primary research articles during the class period.

MICR-J 821 Microbial Pathogenicity (3 cr.): P: Consent of instructor. This course will consider in detail the determinants of microbial virulence and the mechanisms of host responses to infection and how these two factors interact in the pathogenesis of infectious diseases. Department is not currently offering this course.

MICR-J 822 General and Medical Microbiology (3 cr.): Lectures covering the biology of various pathogenic organisms such as bacteria, viruses, fungi, and parasites, their role in human disease with emphasis on determinants of microbial virulence, the mechanisms of host responses to infection, and the role of these factors in the pathogenesis of disease.

MICR-J 826 Bacteriology (3 cr.): P: J601 or J822 or their equivalent and consent of instructor. General concepts of bacteriology. Department is not currently offering this course.

MICR-J 828 Virology: Lecture (3 cr.): Basic biological principles of viruses; agents causing diseases in animals, including humans; interactions of animal viruses with their host cells in tissue culture.

MICR-J 829 Current Topics in Molecular Genetics of Microorganisms (2 cr.): In-depth study of a specific topic in contemporary molecular genetics of microorganisms. Topics varies.

MICR-J 830 Seminar in Microbiology (1 cr.): Provides students with background and practical experience in communication of their research.

MICR-J 840 Mechanisms of Immune Regulation (2 cr.): A current overview of the cellular mechanisms which regulate immune responses. Topics include cells and cytokines involved in antigen presentation, lymphocytes activation and function, development, and tolerance.

MICR-J 842 Neoplastic Determinants (2 cr.): Focus on the genetic basis of the cancer phenotype. Consider effects of DNA sequence mutations, chromosomal rearrangements, and/or introduction of new genetic information on DNA repair, oncogene products and tumor suppressors, Intra- and intercellular consequences of these discrete alterations will be included.

MICR-J 854 Hematopoiesis (2 cr.): Principles of blood cell formation, including the regulation of production, biologic function, and cell culture and recombinant DNA technologies that contribute to our understanding. Stem cells, growth factors, cytokine involvement, gene transfer/ gene therapy and clinical applications.

Musculoskeletal Health Sciences

School of Medicine

Department e-mail: icmh@iu.edu

Departmental URL: medicine.iu.edu/research-centers/musculoskeletal

Director: Melissa Kacena, Ph.D. Director, Indiana Center for Musculoskeletal Health

Graduate Program Directors:

Brenda J. Smith, Ph.D., Co-Director, Musculoskeletal Health Sciences PhD Program

William R. Thompson, Ph.D., Co-Director, Musculoskeletal Health Sciences PhD Program

Curriculum

Courses

Degrees Offered

Doctor of Philosophy in Musculoskeletal Health Sciences

Doctor of Philosophy Degree in Musculoskeletal Health Sciences

Program Description

The PhD program in Musculoskeletal Health Sciences (MSHS) provides training to graduate students who wish to pursue a career in academia, industry, government, or other related professions. The program is based out of the Indiana Center for Musculoskeletal Health (ICMH) within the IU School of Medicine in Indianapolis. The ICMH is one of the premier centers for bone, joint, and muscle research, and offers the only PhD of this type in the U.S. While the focus of the PhD program is on the musculoskeletal system, interdisciplinary training opportunities that span topics such as aging, Alzheimer's disease, cancer, diabetes, exercise, kidney disease,

nutrition, and tissue repair/regeneration are available. The program includes biomedical researchers from the School of Medicine, the School of Health and Human Sciences, and the Biomedical Engineering program, many of whom are leaders in their respective field. These faculty provide a wide range of research opportunities from basic and translational studies to clinical studies in the dynamic field of musculoskeletal health.

Admissions Requirements

The Musculoskeletal Health (MSHS) PhD Program participates in the Indiana Biomedical Gateway (IBMG) Program. The IBMG Program provides a shared first year experience for all of the School of Medicine biomedical science pre-doctoral (Ph.D. program) students. The link for the IBMG program is: medicine.iu.edu/graduate-degrees/phd/Indianapolis. Eligible faculty mentors are members of the Indiana Center for Musculoskeletal Health (ICMH) who are members of the IU Graduate Faculty. Students may arrange to work with a mentor working in range of muscle and skeletal-related research projects. Students will form an Advisory Committee upon acceptance into the MSHS PhD Program.

Program Learning Outcomes

Graduate students earning a Ph.D. in Musculoskeletal Health Sciences from Indiana University on the IU Indianapolis campus will at the completion of their degree be able to:

1. Demonstrate knowledge of key theories, concepts, and approaches in basic, translational, or clinical musculoskeletal health sciences.
2. Apply knowledge from various scientific disciplines (e.g., anatomy, biochemistry, biomedical engineering, cell biology, kinesiology, molecular biology, physics, physiology, etc.) to research questions relevant to musculoskeletal health sciences.
3. Employ rigorous approaches to experimental design and data collection in the musculoskeletal health sciences, including the inclusion of appropriate controls, validation of resources and reagents needed for research, reproducibility of experimental results, and organization of raw data.
4. Demonstrate critical and creative thinking to generate insight, develop strategies, and solve problems in the musculoskeletal health sciences.
5. Conduct novel, independent research under the supervision of a research advisor to design, test and analyze original laboratory or field-based experiments in an ethical and responsible manner.
6. Effectively communicate expert level concepts and research results in the musculoskeletal health sciences through written reports, oral presentations (i.e., lab meetings and/or journal clubs), and both formal and informal discussions.
7. Document an original contribution to the musculoskeletal health sciences field through independent experimental design, peer-reviewed publication of experimental results, and presentation and defense of a dissertation.

Degree Requirements

Requirements for a doctoral degree include completion of 90 credits of which at least 30 are from coursework

and 45-60 are research (MSHS B815). The minimum 30 course credit hours required for the Ph.D. degree are composed of 14 credits from courses required for the major, 4 credits of approved electives and 12 credits that comprise an approved minor.

Required Major Core Courses (14 cr)

- GRDM-G 505 Responsible Conduct of Research (1 cr)
- GRDM-G 507 Reagent Validation as a Means for Enhanced Research Reproducibility (1 cr)
- GRDM-G 801 Cell Biology of the Neuromusculoskeletal System (3 cr)
- GRDM-G 819 Basic Bone Biology (3 cr) G655 Research Communication Seminar (1 cr)
- GRDM-G 855 Experimental Design and Biostatistics (1 cr)
- MSHS-B 842 Musculoskeletal Disease and Injury (3 cr)
- Science Communication requirement - Students will complete one of the following:
 - COMM-C 534 Distilling Your Message (1 cr)
 - COMM-C 533 Improvisation for Scientists (1 cr)
 - ENG-W 533 Science Writing (1 cr)

Major Area Electives (4 cr*) – Fulfill any of the following requirements. Take at least 4 credits in total. Other pre-approved courses may also count.

- MSHS-B 843 Skeletal Muscle in Health and Disease (3 cr)
- ANAT-D 501 Human Gross Anatomy (5 cr)
- ANAT-D 502 Basic Histology (4 cr)
- ANAT-D 851 Histology (4 cr)
- PHSL-F 503 Human Physiology (5 cr)
- GRDM-G 700 Translating Foundational Science to Contemporary Knowledge (1 cr)
- GRDM-G 702 Entering Biomedical Research (1 cr)
- GRDM-G 715 Biomedical Science I – Biochemical Basis of Biological Processes (2 cr)
- GRDM-G 716 Biomedical Science II – Molecular Biology and Genetics (2 cr)
- GRDM-G 717 Biomedical Science III – Cellular Basis of Systems Biology (2 cr)
- GRDM-G 720 Stem Cell Biology (2 cr)
- GRDM-G 725 Gene Therapy (Gene Transfer Approaches to Clinical and Basic Research) (1 cr)
- GRDM-G 727 Animal Models of Human Disease (1 cr)
- GRDM-G 734 Advanced Molecular Imaging (1 cr)
- GRDM-G 737 Introduction to Histology (1 cr)
- GRDM-G 747 Principles of Pharmacology (1 cr)
- GRDM-G 749 Introduction to Structural Biology (1 cr)
- GRDM-G 817 Molecular Basis of Cell Structure and Function (2 cr)
- GRDM-G 848 Bioinformatics, Genomics, Proteomics and Systems Biology (2 cr)
- Courses taken as part of the IBMG first-year experience not listed above may be applied to the major, a minor that permits these courses, or electives in consultation with the Program, the Training and Advisory Committee, and/or the

student's qualification exam/dissertation committee. Additional courses may be taken that are not on this list with the permission of the student's Advisory Committee.

Minor: Students will select a minor consisting of 12 credit hours in a related field, e.g., bioinformatics, biostatistics, business of biomedical science, cancer biology, cardiovascular sciences, clinical research, diabetes and obesity, health informatics, translational science, or in life science. These credits must be in lecture or laboratory courses other than research and must meet the requirements of the department in which the minor is taken. For the life sciences minor, a minimum of 6 credit hours must be obtained in one department.

Research: Minimum of 45 credit hours (MSHS-B815), and these credits are taken until a student reaches 90 credit hours total towards the PhD degree. NOTE: All first-year IBMG Ph.D. students complete three, eight-week rotations GRDM-G718 Research in Biomedical Science (2 cr. each). These 6 credits can be applied toward the research credits.

- MSHS-B 815 Research in Musculoskeletal Health
- GRDM-G 901 Advanced Research in Musculoskeletal Health
 - Maximum of 6 enrollments. This course is part of the ongoing academic component of laboratory-based research that a student in the Musculoskeletal Health program engages in while a student in the program. GRDM-G901 is restricted to students who have completed the 90 credit-hour curriculum of this program but are continuing their dissertation research. Requires consent of the graduate director.

Qualifying Examination

Within the first two years following entry into the Musculoskeletal Health PhD program, the student will submit a written research proposal in the form of a grant application to their advisory committee. The student then has an oral examination administered by the advisory committee and based on the written research proposal and the coursework taken by the student. With consent of the advisory committee, the student can request an extension of up to six months to take the qualifying examination. Doctoral studies are continued if the qualifying examination and other work, including research, are deemed satisfactory by the majority of the advisory and research committees.

Final Examination

Oral defense of the written dissertation.

Other Requirements

It is expected that the student's dissertation research will be of sufficient quality to be published in a primary peer-reviewed journal appropriate for the student's research area.

It is the policy of the Musculoskeletal Health PhD program that all the requirements of the PhD degree program must be completed and the final, approved dissertation thesis deposited with the Graduate School within 5 years of the date of passing the Qualifying Examination. Failure to complete the degree within 5 years of passing the

Qualifying Examination will result in dismissal of the program.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

ANAT-D 501 HUMAN GROSS ANATOMY (5 cr.):

Introduction to the concepts, terminology and basic structure of the human body. Prosection of the body will use a regional approach. Emphasis on providing fundamental knowledge of the structure/function of major organ systems, peripheral nervous system, and vascular supply to the trunk, head and neck, limbs and back.

ANAT-D 502 BASIC HISTOLOGY (4 cr.): Lecture and laboratory instruction on the microscopic structure of the basic tissues and organs of the body. Previous exposure to gross anatomy principles and dissection encouraged.

ANAT-D 851 HISTOLOGY (4 cr.): A complete survey of the microscopic structure of the tissues and organs of the body.

COMM-C 533 IMPROVISATION FOR SCIENTISTS (1 cr.):

Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 DISTILLING YOUR MESSAGE (1 cr.):

Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

ENG-W 533 SCIENCE WRITING (1 cr.): With an emphasis on shorter forms of writing, students discover voices, messages, and forms appropriate for bringing scientific expertise to non-science readers. They practice processes of response, revision, and editing to shape presentations for various readers, contexts, and paths of publication.

GRDM-G 505 RESPONSIBLE CONDUCT OF RESEARCH (1 cr.):

An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 507 REAGENT VALIDATION FOR RESEARCH REPRODUCTION (1 cr.):

"Reagent Validation as a Means for Enhanced Research Reproducibility" is designed to provide training for pre-doctoral students in the area of appropriate reagent utilization by focusing on biological variables, with particular attention to murine models, and on biological and chemical resources, with particular attention to cell line authentication, plasmid verification, and antibody utilization. This course will entail a traditional didactic lecture series accompanied by relevant whole-class practical exercises allowing students to implement basic methods of reagent verification.

GRDM-G 700 TRANSLATING FOUNDATIONAL SCIENCE TO CONTEMPORARY KNOWLEDGE (1 cr.):

G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then through discussion of an assigned paper from the primary literature.

GRDM-G 702 ENTERING BIOMEDICAL RESEARCH (1 cr.):

This mentee training curriculum is designed for first year graduate students to get the most from their mentored research experience. Group activities, case studies and facilitated discussion, are used to cover topics and concepts organized to develop their research skills, interpersonal skills, psychosocial skills, professionalism skills, and group dynamic skills.

GRDM-G 715 BIOMEDICAL SCIENCE I (2 cr.):

One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function. The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G 716 BIOMEDICAL SCIENCE (2 cr.):

Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G 717 BIOMEDICAL SCIENCE III (2 cr.):

Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples. Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G 720 STEM CELL BIOLOGY (2 cr.):

This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external other external stimuli, and what their clinical capabilities are and might be.

GRDM-G 725 GENE TRANSFER APPROACHES:

A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.

GRDM-G 727 ANIMAL MODELS OF HUMAN DISEASE (1 cr.):

This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal

of the course is to provide a framework for students to select experimental animal models in their future research careers.

GRDM-G 734 ADVANCED MOLECULAR IMAGING

(1 cr.): Introduces imaging methods and concepts used in molecular structure as dynamics analysis. The course emphasizes general principles of macromolecular structure and dynamics applied to ensemble and single molecules. Methodologies use visible light, electrons and atomic force mapping.

GRDM-G 737 INTRODUCTION TO HISTOLOGY (1 cr.):

This course is designed to introduce graduate students in the biomedical sciences to the microscopic structure of the tissues and organs of the body. It is the first unit of ANAT-D 851 Histology. Lectures will focus on the structural basis of normal physiology processes, with emphasis of the contribution of the basic tissues (epithelium, nerve, muscle, connective tissue) to simple organ systems (i.e. blood vessels and integument).

GRDM-G 747 PRINCIPLES OF PHARMACOLOGY

(1 cr.): This course is intended for incoming, basic science doctoral graduate students in the School of Medicine Pharmacology & Toxicology programs of other interested graduate students. This course covers the basic of drug receptor interactions, drug metabolism, pharmacokinetics, and pharmacokinetics. This course will include PowerPoint presentations and student presentations.

GRDM-G 749 INTRO TO STRUCTURAL BIOLOGY

(1 cr.): An introduction to structural biology including the fundamentals of macromolecular structure and interactions, methods used to determine three-dimensional structures, the relationship between protein sequence and structure, and prediction and analysis of macromolecular structure.

GRDM G801 CELL BIOLOGY OF THE NEUROMUSCULAR SYSTEM (3 cr.):

Enrollment requires consent of instructor. The overall objective of this graduate course is to present, in an experimental context, information integrating cell structure with cell function. The specific focus is on topics in which new information on cell function has enhanced or reformulated our understanding of cell biology of the neuromusculoskeletal system.

GRDM-G 817 MOLECULAR BASIS OF CELL

STRUCTURE AND FUNCTION (2 cr.): Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 819 BASIC BONE BIOLOGY (1 cr.):

An introduction to basic bone biology, including bone morphology, composition and physiology; cell biology of bone cells; measurement techniques; adaptation to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development.

GRDM-G 848 BIOINFORMATICS, GENOMICS, PROTEOMICS & SYSTEMS BIOLOGY (2 cr.):

Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which in turn have led to a large number of massive

databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G 855 EXPERIMENTAL DESIGN AND RESEARCH BIOSTATISTICS (1 cr.):

This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

MSHS-B 815 RESEARCH IN MUSC HEALTH SCI

(variable cr): This course is the academic component of laboratory-based research that a student in the PhD in Musculoskeletal Health Sciences engages in while a student in the program, especially dissertation research.

MSHS-B 842 MUSCULOSKELETAL DISEASE/INJURY

(3 cr.): The overall objective of the course is to present, in the context of experimental research, the biology of major diseases, disorders, and injuries of the muscle and skeletal systems. The course will incorporate lecture, small group problem solving and journal article review.

MSHS-B 843 SKELETAL MUSCLE HEALTH/DISEASE

(3 cr.): The overall objective of the course is to provide students with a fundamental knowledge of skeletal muscle tissue. Topics will include knowledge of the genetic, cellular, and biochemical basis of muscle adaptation to common physiological stresses such as exercise or again, as well as the pathophysiology of rare and common muscle diseases. The course will incorporate lecture, student-led presentations, small group problem solving and journal article review.

PHSL-F 503 HUMAN PHYSIOLOGY (5 cr.):

Advanced course in human physiology designed for students with no prior exposure to the discipline. Emphasis on basic physiological mechanisms of control with regard to membrane, neural, endocrine, reproductive, muscle, cardiovascular, respiratory, gastrointestinal, renal, and multi-systems physiology.

Music Technology

Herron School of Art & Design

Departmental E-mail: @

Departmental URL: herron.indianapolis.iu.edu/academics/gdegrees

Curriculum

Courses

Degrees Offered

Doctor of Philosophy

Admission Requirements

Candidates should have a minimum grade point average of 3.0 (B) overall from undergraduate studies. E-portfolio comprising online audio/video content demonstrating musical, computational, or other work related to music technology (minimum of 3 samples). Three letters of recommendation in support of the application. Test of English as a Foreign Language is required of international applicants. A personal interview may be requested.

To be eligible for admission to the Ph.D. in Music Technology at IU Indianapolis, you need to meet the following requirements:

- Bachelor's degree and evidence of substantial previous work in creative and/or technical areas related to music technology.
- Minimum grade point average of 3.0 (B) overall from undergraduate studies.
- Submission of the [online application](#) to the campus
- Research Statement – submit a brief essay outlining the applicant's proposed doctoral research, relevant qualifications, and faculty member(s) they wish to work with. Maximum length: three double-spaced pages.
- Three Letters of Recommendation – from individuals who can speak to the applicant's potential for success in graduate study, such as instructors, employers, or mentors.
- Portfolio of Musical/Technical Artifacts – The portfolio is the opportunity for the applicant to persuasively demonstrate the skills, knowledge and potential ability to engage and contribute in high-quality research in Music Technology. You may submit a portfolio of samples of previous professional, artistic or academic work on music, technology and related fields. Examples include, but are not limited to, school papers, sample scientific publications, web pages or audiovisual materials of work you have composed, performed, recorded, mixed and/or produced. The portfolio should be made available online (e.g. in your personal webpage), and the URL included on the resume submitted as part of your application.
- Writing Samples – Upload at least 3 samples of previous scholarly work on music technology or related fields. Applicants must submit at least three papers that best represent their ability to conduct research and write effectively about their area of specialization. Submission of published work is preferred.
- Resume/curriculum vitae - A resume or curriculum vitae (CV) will be submitted to document the applicant's academic, scholarly, and career history.
- Research Advisor Support Letter – The Graduate Program Director will facilitate the applicant in contacting potentially interested advisors. Prior to application, the student will be in contact with an MAT Graduate Faculty member, who will conditionally agree to serve as the applicant's major advisor. This future major advisor will submit a support letter, as part of the application process, that will 1) clearly state that they will serve as the major advisor and 2) explain why the faculty member is a good match for this applicant's particular research interests.
- Unofficial transcripts may be submitted for admissions review purposes. However, official transcripts showing degree conferral and documenting all undergraduate and graduate coursework will be required. Students who have not submitted all required official transcripts by the end of their first semester will have a registration hold placed on their account until the documents are received.

- Non-native English speakers may be required to provide proof of English Proficiency as reflected on the [Graduate School's Testing Website](#).

For applicants who have already completed a master's degree, a transcript review by the MAT Graduate Committee will determine if any credits qualify as applicable to their Ph.D. requirements.

Doctor of Philosophy Degree in Music Technology (on campus only)

Program Information

The Ph.D. in Music Technology is a 90-credit hour terminal research degree that is designed for students with significant academic (or equivalent professional) backgrounds in music technology, music, computer science, engineering, informatics, human computer interaction, and other related fields. The principal objective of the Ph.D. is to create the next leaders in the field who will develop transformative new creative technologies in music and the arts. Generally, research interest will align with faculty research labs: acoustics and signal processing in music technology and healthcare, machine learning and AI in music, music technology education and pedagogy, networked and online music making and collaboration, and performance technologies. The Ph.D. in Music Technology is offered on campus only.

Program Requirements

At Herron, the principal objectives of this 90-credit hour on-campus doctoral program are to create future researchers, educators, and leaders who will:

- Conduct research and develop transformative new technologies in music and the arts
- Examine the practices of designing, making, and managing music technology
- Grow the methodologies of research in music technology
- Apply music technology in society and industry

The 90 credit hours for the Ph.D. are distributed amount the following areas:

- Advanced competencies – 6 credit hours
 - MUS-N 523 Historical Foundations of Music Technology
 - MUS-A 540 Music Engineering Technology
- Seminar – 9 credit hours
 - Enroll in MUS-A 500 every semester until graduation
 - Take at least 6 courses of MUS-A 500
- Declared minor area – 12 credit hours
- Electives – 30 credit hours
- Research Credits/Dissertation - 27-30 credit hours

Academic Progress: Time to Degree

Students enrolled in the Ph.D. in Music Technology have a total of ten (10) years from the date of enrollment to complete the Ph.D.

Grades

A minimum grade point average of 3.0 (B) must be maintained in all course work.

Advancement to Candidacy:

Qualifying Exam

The Qualifying Examination (QE) is a written examination required of all MAT doctoral students. It is a comprehensive, open-book exam. One of the functions of this test is to determine if the student has advanced analytical and critical thinking skills based on their understanding of topics in Music Technology. Students are required to take this test sometime in years 2-4, as specified by the IU Indianapolis Graduate School. The QE may only be taken after the minimum coursework requirements have been fulfilled. In music technology, typically, this equates to 8 courses if the student enters the Ph.D. program with a master's degree or 18 courses for direct Ph.D. students. Questions on the exam are "topics" based and the students will be required to answer four (4) questions covering topics germane to Music Technology. One (1) of the questions will be dedicated to the student's Primary Area of study and another question (1) will be dedicated to the student's Minor Area of study. The other two questions (2) will stem from topics in Music Technology. The examination is four hours in length.

Qualifying Exam and Proposal Defense

The Qualifying Exam and Proposal Defense (Proposal) is given to determine whether a student is adequately prepared to conceive and undertake a suitable dissertation research topic. Students may not schedule their until after they have passed the QE, submitted their final Study Plan, and compiled their Doctoral Research Committee. The QE/Proposal is comprised of a written research proposal, an oral presentation, and an oral examination covering the content of both the student's proposed research. The research proposal shall be a document that fully lays out the proposed research. The document will contain three components: a comprehensive literature review, a set of research questions / hypotheses with proposed work plans, and preliminary project design(s)/result(s) that points to project outcomes. Although there is no official length requirement, a suggested length may be approximately 10,000 words.

Students must complete the QE/Proposal at least two academic sessions (counting regular semesters and summer sessions) for which they are registered before taking the Dissertation Defense/Final Examination. It is recommended for the QE/Proposal to occur within 12-18 months after passing the QE. Since one goal of the QE/Proposal is to provide research direction and feedback, it should be taken early enough to allow the Doctoral Research Committee to make an effective contribution. The written dissertation proposal must be submitted to members of the Doctoral Research Committee at least two weeks before the examination. It is the responsibility of the student to schedule the Proposal in consultation with all Doctoral Research Committee Members.

Dissertation/Final Examination (Defense)

Prior to beginning the dissertation research, the student files a dissertation prospectus, which contains a brief

description of the dissertation proposal, overall format (traditional or manuscript). If applicable, the IRB approval is submitted with the prospectus. The student provides a full, formatted copy of the completed defense to the research committee at least 4 weeks prior to the scheduled defense. Once the dissertation is prepared and all other requirements have been completed, the student must present and defend their work in a Final Examination. The Final Examination Committee is typically the student's Doctoral Advisory Committee. At the end of the oral defense, the research committee votes on the outcome of the examination.

Academic probation, dismissal

A graduate candidate will be put on probation if they have not met the academic, research, or professional conduct standards expected for their level of professional study. In case of academic/thesis probation, the student will be notified in writing of the terms of probation including the criteria that will need to be met along with a timeline for the successful completion of the terms. If a candidate does not, or cannot, meet the terms, timeline, and/or criteria outlined by the probation period, one academic semester unless noted otherwise), then the candidate will be dismissed from the program.

Leave of Absence Policy Overview

Leaves of absence allow graduate students enrolled at Herron School of Art and Design to pause their degree requirements due to unforeseen events that interfere with their academic progress. During a leave, you are not expected to make progress toward your degree. Although you may complete coursework from previous terms during a leave, you may not attend class, use the leave to advance current coursework, prepare for exams, or work on your thesis or master's culminating project. Additionally, students granted leave of absence will not be allowed to complete any university-related work or faculty-guided research. After a leave of absence, you are expected to return to your program of study and resume progress toward your degree. All leave requests are reviewed and granted on a case-by-case basis. If you feel you need to request a leave of absence, please contact the graduate director in your program area to discuss whether or not this may be appropriate for your situation.

Continuing enrollment

Students who have completed all required coursework but whose dissertation is incomplete must enroll each semester (excluding summer sessions) until the committee has approved the final document. Once such students have accumulated 90 credit hours in completed course work and deferred dissertation credits, they must enroll for 6 hours of graduate credit (HER-G901) each semester until the degree is completed. The fee for this course each session is \$150. Students are permitted to enroll in G901 for a maximum of 6 semesters. Failure to meet the continuous enrollment requirement will automatically terminate the student's enrollment in the degree program.

Faculty listings

A list of graduate faculty is available on the [Faculty Member website](#).

Music Therapy

Herron School of Art & Design

Departmental E-mail: @

Departmental URL: herron.indianapolis.iu.edu/academics/gdegrees

Degrees Offered

Doctor of Philosophy

Admission Requirements

To be eligible for admission to the Ph.D. in Music Therapy at IU Indianapolis, you need to meet the following requirements:

- Bachelor's degree from a regionally accredited institution
- Minimum grade point average of 3.0 (B) overall from undergraduate studies
- Submission of the [online application](#) to the campus
- Evidence of current board-certification status (MT-BC) or international equivalent
- CV/Resume documenting a minimum of 3 years (or its equivalent) of clinical practice as a music therapist
- Three letters of recommendation from professionals familiar with the applicant's academic or clinical background.
- Unofficial transcripts may be submitted for admissions review purposes. However, official transcripts showing degree conferral and documenting all undergraduate and graduate coursework will be required. Students who have not submitted all required official transcripts by the end of their first semester will have a registration hold placed on their account until the documents are received.
- Personal Statement
- Non-native English speakers may be required to provide proof of English Proficiency as reflected on the [Graduate School's Testing Website](#).
- A personal interview may be requested.
- A portfolio showcasing the applicant's musicality

For applicants who have already completed a master's degree, a transcript review by the MAT Graduate Committee will determine if any credits qualify as applicable to their Ph.D. requirements. If the applicant completed a thesis-based master's degree, up to thirty (30) credits can be transferred. Specifically, up to twenty-one (21) credits of graded graduate coursework (equivalent to 500-level or higher) can be applied and up to nine (9) credits of appropriate master's thesis-level research credit can be applied. If the applicant completed a "coursework only" master's degree, up to twenty-one (21) credits of graded graduate coursework (equivalent to 500-level or higher) can be applied.

Applicants entering the program post-BS who are interested in earning a MS in Music Therapy prior to continuing their Ph.D. work will be advised to take

appropriate coursework and if applicable, master's thesis-level research credit, that qualify toward the Ph.D. in Music Therapy requirements.

Doctor of Philosophy Degree in Music Therapy (on campus or online)

Program Information

The Doctor of Philosophy in Music Therapy is a research-oriented degree. The degree is designed to prepare board-certified music therapists for independent academic/research careers enabling them to explore the vast ways music influences health and well-being. The principal objectives of this doctoral program are to train music therapists who will conduct research examining current music therapy practice and pedagogy; explore opportunities to optimize music therapy practice and pedagogy; and apply new understandings to clinical practice and education. The overarching goals of the PhD in Music Therapy are guided by the American Music Therapy Association advanced professional competencies. The program is available on campus and online. Faculty and students use internet-based courses, video conferencing, and other technologies to collaborate synchronously. Admission criteria and curricula are the same for on-campus and distance education options.

Program Requirements

The 90 credit hours for the Ph.D. are distributed amount the following areas:

- Advanced music therapy competencies – 18 credit hours
 - MUS-N 521 Research Methods in Music and Multimedia
 - MUS-N 530 Philosophy and Theory in Music Therapy
 - MUS-N 531 Quantitative and Qualitative Research in Music Therapy
 - MUS-N 532 Song Literature IV
 - MUS-N 533 Advanced Clinical Techniques in Music Therapy
 - MUS-N 535 Clinical Supervision Techniques in Music Therapy
- Other Studies in Music – 9 credit hours
 - Take at least 9 credits of MUS- 500 or greater
- Declared minor area – 12 credit hours
- Life Sciences - 6 credit hours
 - Take at least 6 credits with at minimum 1 statistics course
- Electives – 12 credit hours
 - Take at least 12 credits of 500 level or greater
- Research Credits/Dissertation - 33 credit hours
 - MUS-N 899 Music and Arts Technology Dissertation
- Seminar- 0 credit hours
 - Enroll in every semester until graduation
 - Take at least 6 courses of MUS-A 500

Academic Progress: Time to Degree

Students enrolled in the Ph.D. in Music Therapy have a total of ten (10) years from the date of enrollment to complete the Ph.D.

Grades

A minimum grade point average of 3.0 (B) must be maintained in all course work.

Advancement to Candidacy:

Qualifying Exam Proposal/Paper

Within 2 months of coursework completion, the student will submit the qualifying exam proposal. The qualifying examination must be passed at least eight months prior to the date the degree is awarded.

The qualifying examination paper is a scholarly, focused, and critical literature review including an interrogation of at least two theories salient to the chosen topic. The student will discuss the research base including an analysis of research methods, design, and statistics. Students will analyze qualitative, quantitative, and mixed methods studies. Students should be able to link the studies to form a cohesive and coherent argument. At the end of the literature review, the student will identify at least two logical research questions that emerge from the literature review. The QE will be of sufficient length to be inclusive but also focused – generally no more than 30-40 pages of text.

Research Critique Examination

The research critique examination takes place within a week of the QE completion. This examination will consist of analyzing a published research paper (chosen by the committee) within an 8-hour period. The student will not be given the paper ahead of time. The examination will be proctored. Students will analyze each section of the paper using standard practices for each element but concentrating on the research design, analysis, integration of theory, and strengths and limitations. Students are to identify flaws in any section. Further, students will offer at least two options for way to re-design the study to improve it.

Dissertation/Final Examination

Prior to beginning the dissertation research, the student files a dissertation prospectus, which contains a brief description of the dissertation proposal, overall format (traditional or manuscript). If applicable, the IRB approval is submitted with the prospectus. The student provides a full, formatted copy of the completed defense to the research committee at least 4 weeks prior to the scheduled defense. Once the dissertation is prepared and all other requirements have been completed, the student must present and defend their work in a Final Examination. The Final Examination Committee is typically the student's Doctoral Advisory Committee. At the end of the oral defense, the research committee votes on the outcome of the examination

Academic probation, dismissal

A graduate candidate will be put on probation if they have not met the academic, research, or professional conduct

standards expected for their level of professional study. In case of academic/thesis probation, the student will be notified in writing of the terms of probation including the criteria that will need to be met along with a timeline for the successful completion of the terms. If a candidate does not, or cannot, meet the terms, timeline, and/or criteria outlined by the probation period, one academic semester unless noted otherwise), then the candidate will be dismissed from the program.

Leave of Absence Policy Overview

Leaves of absence allow graduate students enrolled at Herron School of Art and Design to pause their degree requirements due to unforeseen events that interfere with their academic progress. During a leave, you are not expected to make progress toward your degree. Although you may complete coursework from previous terms during a leave, you may not attend class, use the leave to advance current coursework, prepare for exams, or work on your thesis or master's culminating project. Additionally, students granted leave of absence will not be allowed to complete any university-related work or faculty-guided research. After a leave of absence, you are expected to return to your program of study and resume progress toward your degree. All leave requests are reviewed and granted on a case-by-case basis. If you feel you need to request a leave of absence, please contact the graduate director in your program area to discuss whether or not this may be appropriate for your situation.

Continuing enrollment

Students who have completed all required coursework but whose dissertation is incomplete must enroll each semester (excluding summer sessions) until the committee has approved the final document. Once such students have accumulated 90 credit hours in completed course work and deferred dissertation credits, they must enroll for 6 hours of graduate credit (HER-G901) each semester until the degree is completed. The fee for this course each session is \$150. Students are permitted to enroll in G901 for a maximum of 6 semesters. Failure to meet the continuous enrollment requirement will automatically terminate the student's enrollment in the degree program.

CURRICULUM FOR MUSIC THERAPY PH.D. PROGRAM

Required Music Therapy Course Descriptions

MUS-N 521 Research Methods in Music and Multimedia (3 cr.)

: Consent of instructor. Introduction to the underlying principles and concepts of technology-based studies in the arts. Techniques of educational research, including integration of scientific methodology, descriptive, and inferential methods, and multimedia instrumentation in project development.

MUS-N 530 Philosophy and Theory in Music Therapy (3 cr.)

: Consent of instructor. This course covers the philosophical and theoretical foundations of the use of music in and as therapy. We explore and discuss philosophical positions concerning what it means to be human, what it means to be healthy or diseased, how humans "know", how we construct theories, and what

our theories say about what we value in the therapeutic process. The course includes theoretical approaches students may not have studied during undergraduate course work.

MUS-N 531 Music Quantitative and Qualitative Research (3 cr.): Consent of instructor. Applications of scientific methodology to music therapy theory and practice. Philosophical differences between qualitative and quantitative research paradigms, integration of theoretical concepts and practice standards with scientifically-sound research proposals.

US-N 532 Music in Medicine (3 cr.): Consent of instructor. The focus of this course is the evidence-based application of music in medical settings to facilitate symptom relief and improve the health and well-being of clients. Students will critique the scientific, theoretical, and empirical basis for music interventions.

MUS-N 533 Advanced Clinical Techniques in Music Therapy (3 cr.): Consent of instructor. This course is designed to develop advanced level protocol delivery and data collection skills. Students will develop and carry out a music therapy protocol and provide a written theoretical rationale and critique of the protocol's effectiveness. This class services as a graduate clinical practicum. Students will engage in weekly supervision.

MUS-N535 Clinical Supervision in Music Therapy (3 cr.): Consent of instructor. This course is designed to introduce students to models of supervision and supervisee development, ethics in supervision, and applying a critical lens to the covered approaches and topics.

MUS-N899 Music and Arts Technology Dissertation (1-9 credits)

MUS-A 500 Music Technology Graduate Seminar (0 cr.) The Music Technology Graduate Seminar is a zero (0) credit hour graduate course consisting of 15 weekly seminars by the Department of Music and Arts Technology and other engineering and technology faculty at IU Indianapolis researchers from local and national academia, representatives from industry, and peer graduate students in the MAT. Seminars introduce MAT graduate students to a variety of music technology related topics in academic and industrial research. Presenters will pose research questions, scientific methodologies, and technological advancements in music technology and related fields. Presentations and discussions will assist students in developing and refining critical thinking and technical presentation skills.

Note: With the approval of the student's Advisory Committee, other courses may be substituted for those listed above.

Faculty Listings

[Faculty members](#)

Museum Studies

School of Liberal Arts

Departmental email: museum@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/programs/museum-studies

Curriculum

Degrees Offered

Master of Arts in Museum Studies, Graduate Certificate in Museum Studies

Program Information

The Museum Studies program provides an integration of museum history and theory with hands-on instruction in museum techniques and practices. It encompasses the scholarly exploration of museums, including their history, operations, ethics and role in society from interdisciplinary perspectives, while also training students in the technical aspects of museum work such as collections care and management, administration, education, exhibit planning and design, curatorial practices, visitor studies and technology. The program offers a master's degree and a graduate certificate. Students considering application to the certificate or degree program are welcome to take classes prior to formal admission. Students admitted to the graduate program may apply to count credits earned as a non-degree student toward their graduate credential (up to 6 credits toward the graduate certificate and up to 9 credits toward the master's degree). As an urban university, IU Indianapolis is part of a community with a rich heritage of museums and cultural arts. Faculty appointed as Public Scholars of Civic Engagement craft relationships and sustainable partnerships with area museums and cultural institutions and involve undergraduate and graduate students in meaningful ways in those collaborations. The Museum Studies program has an extensive network of adjunct faculty and guest lecturers who bring state-of-the-art museum practice to the curriculum. The program also offers opportunities for student learning through the resources of the museum community with experiences such as internships; collaboration on exhibit development and design; exhibition- and collections-focused projects; collections research; collaboration with faculty on museum research projects; and participation in museum-sponsored seminars, lectures, and professional meetings. The integral role of Indianapolis museums in the Museum Studies curriculum fosters a critical, reflective, and scholarly discourse on museums that is applied to current practices and issues in the field.

Admission Requirements

1. Bachelor's degree and transcripts from all colleges and universities attended, with an overall undergraduate GPA of at least 3.0.
2. Three letters of recommendation
3. Personal statement
4. CV or resume
5. Writing sample
6. International students must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317- 274-7000.
7. The following deadlines must be observed in order to receive consideration for admission:

January 15 – priority admission consideration for fall

March 1 – regular fall admission consideration

Graduate Certificate in Museum Studies

The Graduate Certificate in Museum Studies (18 credit hours) provides students with interdisciplinary training in museum practice and knowledge of contemporary issues in the museum field. It trains students in specialized aspects of museum practice such as education, exhibit planning and design, collections care, curatorial practices, philanthropy, and nonprofit management by combining Museum Studies course work with curriculum in other IU schools (e.g., Anthropology, Public History, Philanthropic Studies, Education, SPEA, Library Science). Students are given an introduction to the history and philosophy of museums and an opportunity to focus on particular aspects of museum practice.

The Graduate Certificate may be taken as a freestanding credential or paired with graduate work in another related discipline. Because it offers an opportunity to focus on specific areas of museum practice, the graduate certificate is also a suitable credential for current museum professionals who wish to enhance their professional training or develop new specialties. For specific requirements and options for cross-listed courses, meet with an academic advisor. Students in other graduate programs who wish to add the graduate certificate to their program of study must formally apply to the Museum Studies program separately.

Students in the Public History program who add the Museum Studies Graduate Certificate can combine certain Public History courses with Museum Studies offerings to complete the certificate with just one additional course. Students should consult with advisors in both programs to establish their program plan.

Course Requirements

Graduate Certificate requirements (18 cr.). Minimum course grade allowed is B-.

Required courses (6 cr.):

- MSTD-A 503 Introduction to Museum Studies (3 cr.) or HIST-H 542 Public History (3 cr.)
- MSTD-A 508 Museum Internship (3 cr.)

Elective courses (12 cr.)

Students must consult the Plan of Study for all elective options. Students may take any Museum Studies graduate course to meet the electives requirement. They may also select from certain graduate courses in Anthropology, Herron Art, History, Journalism, Library and Information Science, Non-Profit Management, Philanthropic Studies, and Sociology.

For students in the Museum Studies Graduate Certificate program and M.A. in History program who choose public history as their area of concentration (18 cr.)

In order to complete the certificate while simultaneously completing the M.A. in History (Public History concentration), students must apply and be admitted to both the History M.A. program and Museum Studies Graduate Certificate program and complete the requirements for both the degree and the certificate. Students should consult with advisors in both programs.

The Graduate Certificate must be awarded before or at the same time as the master's degree in History. The following courses fulfill requirements in both programs:

- Taking HIST H543 Internship: Practicum in Public History *when focused on museums* (4 cr.) counts as an equivalent for MSTD-A 508
- Taking HIST-H 548 Historic Administration/Museum Administration (3 cr.) counts as an equivalent for MSTD-A 548
- Taking HISTH 542 Public History (4 cr.) may count as an equivalent for MSTD-A 503
- Any HIST-H 547 Special Topics in Public History (3 cr.) classes are approved electives for the Museum Studies Graduate Certificate curriculum
- History MA (Public History concentration) students may use up to two Museum Studies courses to count as the "6 credits outside the department of History" requirement.

Master's Degree in Museum Studies

The Museum Studies M.A. curriculum (36 credit hours) consists of a required introductory course, a set of integrated core courses which provide a broad-based interdisciplinary training in museum practice, a choice of elective courses that allow the student to develop a particular specialty, and a capstone colloquium course preparing students for entry into the museum workforce. The coursework is complemented by an internship that provides an opportunity for an intensive applied learning experience in a museum. The interdisciplinary curriculum and flexible structure allow students to achieve either a generalist breadth suitable for those working in smaller museums or to focus on a particular area of museum practice appropriate for a specialist on the staff of a larger museum.

Team-based and applied projects form a core learning experience in all classes and present opportunities to work with community partners as well as peers in the program. Team projects such as exhibit development and visitor studies prepare students for the collaborative approach that is central to the museum field.

Course Requirements

The Master of Arts in Museum Studies is a 36-credit hour program. Minimum course grade allowed is B-. Students must maintain a GPA of 3.0.

- Required courses (18 cr.) MSTD-A 503 Introduction to Museum Studies (3 cr.)
- MSTD-A 510 Museum Education (3 cr.)
- MSTD-A 512 Exhibit Planning and Design (3 cr.)
- MSTD-A 516 Collections Care and Management (3 cr.)
- MSTD-A 548 (3 cr.) or HIST-H 548 Historical Administration (3 cr.)
- MSTD-A 530 Museum Colloquium (3 cr.)
- MSTD-A 508 Internship (6 cr.) Electives (12 cr.)

Students must consult the Plan of Study for all elective options. Students may take any Museum Studies graduate course to meet the electives requirement. They may also select from certain graduate courses in Anthropology, Herron Art, History, Journalism, Library and Information

Science, Non-Profit Management, Philanthropic Studies, and Sociology.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Description

- **MSTD-A 503 Introduction to Museum Studies (3 cr.)** This survey of museology introduces students to the history of museums and to debates on the philosophical nature of museums and their roles in society. The course covers the types and definitions of museums, traces the history of museums, discusses contemporary museum practice and examines current issues in the museum profession.
- **MSTD-A 505 Museum Methods (3 cr.)** This survey of museum practice introduces students to methods, skills, and resources in three areas of museum work: artifacts, interpretation, and organizational administration, as well as to the ethical ramifications of these methods (course does not count toward the Master's degree, but it does count toward the graduate certificate).
- **MSTD-A 507 Indigenous Cultural Heritage (3 cr.)** Students will explore the deeper meanings of Indigenous cultural heritage expressed in both tangible culture and intangible customs, values, practices, artistic expressions, oral tradition, ritual, memory, sense of place, and identity. Students will consider deeper meanings embedded in heritage and the relationships. Relying heavily on the scholarship of Indigenous authors.
- **MSTD-A 508 Museum Internship (1-6 cr.)** P: A503 and two other museum studies graduate courses or consent of the instructor. An arranged learning experience in museum work appropriate to individual career goals, focusing on an aspect of museum practice and working with a museum mentor. May be repeated for credit.
- **MSTD-A 509 Applied Research in Museums (1-6 cr.)** An interdisciplinary research practicum conducted in collaboration with museum studies students, faculty and museum partners. The course provides students with an opportunity to work in conjunction with museum professionals to conduct research and carry out public projects in museum settings. The course may focus on exhibition planning, public programs and symposia, curatorial projects, and national collaborations.
- **MSTD-A 510 Museum Education (3 cr.)** P: A503 or consent of instructor. This survey of museum education introduces students to a variety of professional skills through exercises, projects, museum visitor observation, and in-museum classes. It covers education theory most central to museum practice, the duties of museum educators, and current issues in museum education. (Core course)
- **MSTD-A 511 Object –Based Learning (3 cr.)** This class is about objects, broadly construed, and our relationship to them in and out of museum settings. The class examines the multiple ways that people learn from and with objects in museums using a range of disciplines including education, history, semiotics, material culture, anthropology, and psychology. Students will investigate the strategies needed to fully support learning from and with objects in the museum setting and consider how visitors learn through their transactions with objects.
- **MSTD-A 512 Exhibit Planning and Design (3 cr.)** P: A503 or consent of instructor. This course offers a survey of museum exhibit planning and design through an integration of theory and practice. The class introduces students to exhibit development, including exhibit administration, design, and evaluation, and to a variety of professional skills through hands-on exercises, exhibit critiques, museum observations, and in-museum classes. (Core course)
- **MSTD-A 513: Curatorial Practices (3 cr.)** This seminar-style course will examine current and historical curatorial practices in museums and other exhibition contexts. Case studies will introduce a range of approaches to the storytelling practices involved in curatorial work. Over the course of the semester students will also develop and execute their own curatorial project.
- **MSTD-A 514 Museums and Technology (3 cr.)** P : A503 or consent of instructor. This course surveys the growing use of technology in museums. It examines applications for information management in collections, conservation science, and archives. It examines critically the use of technology in the service of education both in exhibit contexts and in the variety of educational programs and Web-based dissemination of knowledge.
- **MSTD-A 516 Collections Care and Management (3 cr.)** P: A503 or consent of instructor. A survey of techniques for the management and care of collections in museums. It covers documentation, management of collections, processes, administrative functions, risk management, and ethical and legal issues. The course also covers the physical care and conservation of collections. (Core course)
- **MSTD-A 517: Preventive Conservation (3 cr.)** This course offers a theoretical and practical investigation of preventive conservation which aims to eliminate or modify conditions that encourage deterioration. Preventive conservation is the broadest technique by which preservation of museum objects and collections is achieved. Emphasis is placed on measures that prevent or reduce the potential for damage and loss. Central to preventive conservation methodology, topics include handling procedures, proper storage, environmental management, agents of deterioration, risk analysis, emergency preparedness and planning.
- **MSTD-A 518 Museums and Audiences (3 cr.)** P: A503 or consent of instructor. This course examines the ways museums seek to better understand their audiences, serve them more effectively, and strive to reach new audiences. The course looks at a broad range of visitor studies and the ways in which museums and audiences interact.
- **MSTD-A 520 Museums, Health, and Well-Being (3 cr.)** Drawing on multiple disciplines including medicine, psychology, and social work, this course

surveys theories and trends informing museums' engagement with the health and well-being of individuals, relationships, and communities. Students will explore wellness beliefs and practices, implement an innovative service-learning project, and develop skills for well-being work using museum resources.

- **MSTD-A 521 Museum Theatre and Live Interpretation (3 cr.)** The purpose of this course is to provide an in-depth look at the use of museum theatre and live interpretation in museum settings to advance the educational mission and nature of museums. The class examines theatrical techniques, program development and management, and interpretation approaches for a wide variety of museum exhibits and audiences.
- **MSTD-A 530 Museum Colloquium (3 cr.)** This course provides graduate students with the tools and knowledge necessary to assess, understand, and utilize the links among their education, goals, and career opportunities. It supports graduate students approaching the end of their degree program in 1) exploring the connections between the museum knowledge they have mastered and the skills they have developed, 2) framing and articulating their knowledge and skills as well as their vocational goals to others including prospective employers, 3) developing critical competencies for community-focused museum work, and 4) creating professional plans as they transition into or advance in the work force or pursue further education.
- **MSTD-A 531: Critical Approaches to Museum Practice (3 cr.)** This class examines the potential of applying critical pedagogical methods to curatorial practices, interpretation, museum education, and exhibition development as a way to focus on engaging the visitor with artifacts, opening up civic discourse, and promoting deeper connection to community.
- **MSTD-A 540: Cultural Heritage (3 cr.)** This course explores a variety of issues related the stewardship of cultural property on a local, national, and global scale. Through readings, case studies, discussion, and a semester-long project, students will explore ethical, economic, legal, political, and pragmatic issues related to tangible and intangible heritage and will increase their understanding of the practices and processes of cultural heritage management.
- **MSTD-A 548 Museum Administration (3 cr.)** This course presents an overview of issues faced by administrators and mid-level managers who work in museums, historical societies, archives, special collection libraries, and other cultural resource agencies. Topics, speakers, and readings are focused on issues that are unique to agencies that collect, preserve, and interpret cultural resources. (Core course)
- **MSTD-A 560 Current Topics in Museum Studies (3-9 cr.)** Intensive graduate-level study and analysis of selected topics in museum studies. Topics will vary from semester to semester. Includes topical courses such as Museum Communication Strategies, Museums and Sustainability, Museum Ethics, Museums and Indigenous People, African-

American Museums, Archaeological Curation. May be repeated three times for 9 credits.

- **MSTD-A 577 Community Collaboration and Curation (3 cr.)** Students in various fields, including anthropology, history, museum studies, Native and Indigenous studies explore meaningful collaboration through a community-based project. Students will focus on Anishinaabe culture through a combination of lectures, group discussions and a community component at the Saginaw Chippewa Indian Tribe's Ziibiwing Center.
- **MSTD-A 595 Independent Learning in Museum Studies (1-9 cr.)** A supervised, in-depth examination through individual reading and research on a particular Museum Studies topic selected and conducted by the student in consultation with a faculty member. May be repeated three times for 9 credits.

Nonprofit Management

Paul H. O'Neill School of Public and Environmental Affairs

Departmental Email: @

Departmental URL: oneill.indianapolis.iu.edu

Degrees Offered

Ph.D. Minors:

Criminal Justice
Environmental Policy and Sustainability
Homeland Security and Emergency Management
Nonprofit Management
Policy Analysis
Public Management

Course Requirements

1. The doctoral student must secure an advisor from the faculty of the O'Neill School of Public and Environmental Affairs. The faculty advisor will serve as the representative of O'Neill in all examinations and other requirements of the student's Ph.D. program that pertain to the minor.
2. The minors require 12 credit hours of courses approved by the advisor
3. A minimum cumulative grade point average of 3.0 (B) must be attained in all courses used for the minor.
4. Special requirement for 500-level courses. Students taking a 500-level course are required to show that they have completed doctoral-level work in conjunction with the course to count the course for the minor. Students must alert the instructor to their doctoral status and request additional alternative assignments. If the instructor is unwilling to provide them, the student should select a different course in conjunction with the candidate's advisor.

PhD minor in Criminal Justice

Required courses

- SPEA-J 501 Evolution of Criminological Thought and Policy (3 cr)
- SPEA-J 582 Criminal Justice Systems (3 cr)

Elective courses

- SPEA-J 528 Risk Analysis for Public Safety (3 cr)
- SPEA-J 502 Research Methods in Criminal Justice & Public Safety (3 cr)
- SPEA-J 586 Public Safety in the United States (3 cr)
- SPEA-J 520 Mapping and Analysis for Public Safety (3 cr)
- SPEA-J 524 Emergency Management (3 cr)
- SPEA-J 531 National and Homeland Security in America (3 cr)
- SPEA-J 682 Planning and Management for Criminal Justice & Public Safety (3 cr)
- Other courses may be approved by the advisor

PhD Minor in Environmental Policy & Sustainability

Required courses

- SPEA-V 519 Seminar in Environmental Policy and Sustainability (3 cr)
- SPEA-V 520 Environmental Policy Analysis (3 cr)
- SPEA-V 527 Urban Sustainability (3 cr)

Elective courses

- SPEA-E 511 Sustainability Assessment (3 cr)
- SPEA V-528 Energy, Policy, and Sustainability (3 cr)
- SPEA-E 529 Applications of Geographic Information Systems (3 cr)
- SPEA-E 560 Environmental Risk Analysis (3 cr)
- Other courses may be approved by the advisor

PhD Minor in Homeland Security and Emergency Management

Required courses

- SPEA-J 524 Emergency Management (3 cr)
- SPEA-J 528 Risk Analysis for Public Safety (3 cr)
- SPEA-J 531 National and Homeland Security in America (3 cr)

Elective courses

- SPEA-J 520 Mapping and Analysis for Public Safety (3 cr)
- SPEA-J 581 Public Safety Law (3 cr)
- SPEA-J 586 Public Safety in America (3 cr)
- SPEA-J 682 Planning and Management for Criminal Justice and Public Safety (3 cr)
- Other courses may be approved by the advisor.

Nonprofit Ph.D. minor

Required courses

- SPEA-V 522 Human Resources Management in the Nonprofit Sector (3 cr)
- SPEA-V 525 Management in the Nonprofit Sector (3 cr)
- SPEA-V 526 Financial Management in the Nonprofit Sector (3 cr)

Elective courses

- SPEA V-521 The Nonprofit and Voluntary Sector (3 cr)
- SPEA-V 544 Marketing for Nonprofit Organizations (3 cr)
- SPEA-V 557 Proposal Writing and Grant Administration (3 cr)
- SPEA-V 558 Fund Development for Nonprofit Organizations (3 cr)
- SPEA-V 559 Principles and Practices of Social Entrepreneurship (3 cr)
- Other courses may be approved by the advisor.

PhD Minor in Policy Analysis

Required Courses

- SPEA-V 512 Public Policy Process (3 cr)

Elective Courses

- SPEA-V 507 Data Analysis and Modeling for Public Affairs (3 cr)
- SPEA-V 517 Public Management Economics (3 cr)
- SPEA-V 562 Public Program Evaluation (3 cr)
- SPEA V-663 Policy Analysis (3 cr)
- Other courses may be approved by the advisor.

PhD Minor in Public Management

Required Courses

- SPEA-V 502 Public Management (3 cr)

Elective Courses

- SPEA V-511 Collaborative Governance (3 cr)
- SPEA V-512 Public Policy Process (3 cr)
- SPEA V-526 Financial Management for Nonprofit Organizations (3 cr)
- SPEA-V 547 Negotiation and Dispute Resolution for Public Affairs (3 cr)
- SPEA-V 560 Public Finance and Budgeting (3 cr)
- SPEA-V 561 Public Human Resource Management (3 cr)
- SPEA-V 566 Executive Leadership (3 cr)
- SPEA-V 562 Public Program Evaluation (3 cr)
- SPEA-V 569 Managing Interpersonal Relations (3 cr)
- SPEA-V 652 Managing Workforce Diversity (3 cr)
- Other courses may be approved by the advisor

Nursing

School of Nursing

Departmental E-mail: nursing@iu.edu

Departmental URL: nursing.iu.edu/indianapolis

Curriculum

Program Information

Indiana University School of Nursing has a proud tradition of conducting research that makes an impact on nursing professionals and students as well as patients and their families. Our faculty members are innovative investigators who explore the most pressing issues affecting the nursing profession today. Learn more about our faculty and our areas of research excellence:

- [Serious Illness Care](#)
- [Health and Community Systems](#)
- [Quality of Life and Chronic Condition Management](#)
- [Prevention and Health Promotion](#)

Degrees Offered

The Doctor of Philosophy in Nursing Science (PhD degree) is offered through the Graduate School. In addition, the School of Nursing offers a Master of Science in Nursing (MSN degree) and Doctor of Nursing Practice (DNP degree), as well as graduate certificates. See the [IU School of Nursing Graduate Program Bulletin](#) for more information about the MSN, DNP, and certificate programs.

Doctor of Philosophy in Nursing Science Degree

Special Departmental Requirements

Minimum passing grade requirement of B- (80%) in all courses.

(See also general Graduate School requirements.)

Program Learning Outcomes

PhD in Nursing Science graduates are well-positioned for a successful career as a leader within academic and practice settings. Graduates of the program are expected to:

- Synthesize knowledge from nursing as well as biological and behavioral sciences to investigate health phenomena.
- Utilize analytical and empirical methods to extend nursing knowledge and scholarship.
- Conduct and communicate independent research that advances the body of scientific knowledge.
- Defend the social significance of the expanded knowledge base of nursing.
- Interpret nursing science within an interdisciplinary context.

Focus Areas of Study with Wide Application

The PhD program encompasses a wide scope of scientific inquiry including Clinical Nursing Science and Health Systems research. Clinical Nursing Science, based on biological, behavioral, and other types of investigations, provides the scientific basis for the care of individuals across the lifespan, families, and/or communities. Health Systems research examines ways to improve health outcomes in complex systems including those related to the availability, quality, and costs of health care services.

Students who pursue the PhD in Nursing Science choose one of two focus areas: Clinical Nursing Science or Health Systems. PhD students work closely with faculty mentors utilizing the resources available at the Indiana University

School of Nursing and participate in intensive research studies. Focus areas reflect faculty research strengths.

Clinical Nursing Science

Clinical Nursing Science concentrates on the interrelationships of health promotion, health behavior and quality of life in acute and chronic illness throughout the lifespan. This focus area includes the prevention and early detection of disabilities across the continuum of care and the enhancement of the health and well-being for individuals, families, and communities.

Examples of faculty research within the focus area of Clinical Nursing Science include:

1. Improving quality of life in persons with chronic illness, including epilepsy, stroke and renal disease
2. Behavioral oncology across the cancer continuum (including cancer prevention, detection, and symptom management)
3. Family caregiving across the lifespan
4. Tailored intervention studies to improve quality of life
5. Childhood and family adaptation to chronic illness
6. Patient care safety

Health Systems

Health Systems operate to create structures and resources that enable individuals and communities to achieve optimal health. This focus area includes health policy and administration.

Examples of scholarship and faculty research within the focus area of Health Systems include:

1. Clinical reasoning
2. Health policy and public policy analysis
3. Computer systems to enhance care delivery
4. Community-based care coordination
5. Patient care simulations

PhD Minors

The IU School of Nursing offers two doctoral minors that are open to PhD students in other disciplines.

PhD Minor in Symptom Science and Self-Management

The minor is designed for doctoral students and postdoctoral fellows in health science programs. This 12-credit minor will prepare students to: 1) understand the NIH Symptom Science Model to guide symptom research; 2) explore biological and patient-reported measures, research methods, and models relevant to symptom science; 3) examine the role of self-management in improving outcomes for people with chronic conditions; and 4) determine the components of effective self-management interventions.

Required Courses (6 cr.):

- NURS-R 702 Biological and Behavioral Foundations of Self-Management Interventions (3 cr.)
- NURS-R 703 Symptom Science: Models, Methods, and Measures (3 cr.)

Select two additional elective courses from the following list (6 cr.):

- NURS-D 609: State of the Science Seminar (2 cr.)

- NURS-R 601: Instrumentation and Measurement (3 cr.)
- NURS-R 605: Design and Applications of Advanced Research Designs/Interventions (3 cr.)

PhD Minor in Advanced Research Methods

This minor is designed for postdoctoral fellows or PhD students enrolled in health science programs. The 12-credit minor will prepare students to: 1) understand the philosophical and historical underpinnings of quantitative research methods; 2) understand the philosophical and historical underpinnings of qualitative research methods; 3) evaluate the key tenets, procedures, strengths, and limitations of advanced research designs; 4) apply advanced research methods to a program of research.

Select 12 credit hours from the below lists of courses. Advanced Methods courses placement and permissions will be evaluated to ensure prerequisites for courses are satisfied:

Core Methods courses:

- NURS-R 603 Foundations of Quantitative Research
- NURS-R 610 Foundations of Qualitative Research
- NURS-R 601 Instrumentation and Measurement

Advanced Methods courses:

- NURS-R 605 Design and Applications of Advanced Research Designs/Interventions (3 cr.)
- NURS-R 613 Grounded Theory Research (3 cr.)
- NURS-R 615 Comparative Effectiveness Research and Patient-Centered Outcomes Research (CER/PCOR) (3 cr.)

Admission Requirements

Matriculation Term: Fall only

Application Opens: October 15

Application Deadline: January 15

Admission Criteria:

- Completion of a Bachelor of Science in Nursing or Master of Science in Nursing from a program within a regionally accredited institution of higher education. (Indiana University School of Nursing faculty retain the right to determine acceptable accreditation status of nursing programs from which applicants have graduated.)
- A baccalaureate cumulative grade point average of 3.0 on a 4.0 scale. For applicants holding a master's degree, a cumulative graduate GPA of 3.0 or higher is required. (The master's degree GPA will supersede the baccalaureate GPA.)
- Completion of a 3-credit-hour graduate level statistics course with a grade of B- or better for students applying to the MSN-PhD track only.

Required Application Materials:

- Online application
- Official transcripts for all post-secondary coursework completed outside of the IU system
- Personal statement
- Scholarly writing sample

- Three professional or academic references indicating ability to succeed in the PhD program
- Current resume or curriculum vitae
- Proof of English Proficiency for non-native English speakers
- Qualified applicants will be invited to a formal admission interview with PhD faculty

Opportunities for Financial Aid

A select number of competitive School of Nursing fellowship funding packages are available to PhD students pursuing full-time study. These packages may include tuition remission, a stipend, and/or student health insurance coverage. Other sources of institutional aid include Graduate School fellowships, IU School of Nursing scholarships, and teaching and research assistantships.

Additionally, past PhD students have also been successful in securing external funding for their doctoral education from:

- Research Training Grants and Fellowships
- Nurse Faculty Loan Program
- The American Organization of Nurse Leaders
- The National Institute of Nursing Research
- The Mary Margaret Walter Program for Cancer Care Research
- The American Cancer Society
- The Oncology Nursing Foundation
- Jonas Scholars

Students interested in financial aid should consult with the Office of Student Financial Aid Services' Graduate Nursing Liaison at nursaid@iu.edu. Students are encouraged to complete the FAFSA.

Further cost and financial aid information, including a link to the IU scholarship application, may be obtained on the IU School of Nursing website: <https://nursing.iu.edu/admissions/cost-fin-aid/graduate.html>.

PhD in Nursing Science Curriculum

The PhD in Nursing Science curriculum consists of six core areas and MSN to PhD Bridge coursework totaling 90 credit hours. Up to 30 of these credit hours may be met by Master of Science course work.

1. BSN-PhD Bridge Coursework or MSN transfer credits (30 cr.)
2. Professional Development Core (6 cr.)
3. Nursing Theory Core (6 cr.)
4. Nursing Science Research Major (15 cr.)
5. Nursing Science Concentration (8 cr.)
6. Minor (external or internal) (9-12 cr.)
7. Dissertation (16 cr.)

BSN to PhD Bridge Coursework (30 cr.)

- NURS-N 502 Nursing Theory for Advanced Nursing Practice (3 cr.)
- NURS-R 505 Measurement and Data Analysis (3 cr.)
- NURS-R 500 Nursing Research Methods (3 cr.)
- Pick one MSN bridge elective (not taken elsewhere in plan of study):
 - NURS-D 721 Advanced Leadership in Complex Systems (3 cr.)

- NURS-R 702 Biological & Behavioral Foundations of Self-Management Interventions (3 cr.)
- NURS-R 703 Symptom Science: Models, Methods, & Measures (3 cr.)

- Additional graduate coursework totaling (18 cr.)

Professional Development Core: (6 cr.)

- NURS-D 602 Responsible Conduct of Research (1 cr.)
- NURS-D 701 Nursing Inquiry and Scholarship (3 cr.)
- NURS-T 800 Preparing Future Faculty (2 cr.)

Nursing Theory Core: (6 cr.)

- NURS-D 607 Theoretical Perspectives of Nursing Science (3 cr.)
- NURS-D 608 Middle-Range Theory (3 cr.)

Nursing Science Research Major (15 cr.); the following 9 credits are required. Students select the remaining 6 credits from the list of Cafeteria Options below.

- NURS-R 607 Advanced Statistics in Nursing Research (3 cr.)
- NURS-R 603 Quantitative Research Design and Methods (3 cr.)
- NURS-R 610 Foundations of Qualitative Research (3 cr.)

Cafeteria Options: Select two additional courses from below:

- NURS-D 743 Trans-disciplinary Approaches to Influencing Public Health Policy (3 cr.)
- NURS-R 601 Instrumentation and Measurement (3 cr.)
- NURS-R 605 Advanced Research Design and Interventions in Nursing (3 cr.)
- NURS-R 613 Grounded Theory Research (3 cr.)
- NURS-R 615 Comparative Effectiveness Research and Patient-Centered Outcomes Research (CER/PCOR) (3 cr.)
- NURS-R 703 Symptom Science: Models, Methods, & Measures (3 cr.)
- NURS-R 704 Developing Grant Applications for Health Sciences (3 cr.)
- NURS-W 540 Writing for Publication in Health Sciences (3 cr.)

Nursing Science Concentration (8 cr.)

- NURS-D 609 State of the Science Seminar (2 cr.)
- NURS-D 752 Directed Research Practicum (3 cr.)
- Plus one of the following courses:
 - NURS-D 721 Advanced Leadership in Complex Systems (3 cr.)
 - NURS-R 702 Biological & Behavioral Foundations of Self-Management Interventions (3 cr.)
- NURS-R 703 Symptom Science: Models, Methods, & Measures (3 cr.)

Internal or External Minor (9-12 cr.)

Cognate or supporting course work from inside or outside nursing. May include minor in an alternate focus area, other approved minors, or individualized plans developed by the student's program planning advisory committee.

Dissertation (16 cr.)

- NURS-R 899 Dissertation in Nursing (1 to 9 variable cr.)

PhD Milestones

PhD Qualifying Examination (Policy# AFS-60)

PhD students at IU School of Nursing complete a qualifying examination as outlined in the Indiana Graduate School Bulletin. The exam:

1. Covers the major subjects.
2. Includes at least one question related to the minor subject.
3. Includes a written examination and an oral defense.
4. Is taken after the completion of required course work.
5. Is successfully completed at least 8 months prior to awarding of the PhD degree.

Purpose

The purpose of the qualifying examination is to assess student readiness to conduct independent research within their individualized phenomena of interest. The qualifying examination is to ensure the integrity of the PhD program by demonstrating that the student has mastered knowledge of the focus field/specialty and obtained the requisite inquiry skills. The qualifying examination serves as a partial summative evaluation of the student's progress in the PhD program and is used to determine the degree to which the student is able to demonstrate integration and synthesis of the knowledge, skills, and values acquired through PhD study.

Procedures

The student's PhD Advisory Committee plans and supervises the qualifying examination. The student and the PhD Advisory Committee Chairperson meet prior to the qualifying examination to review campus and school procedures and expectations of the student.

Qualifying Examination

The qualifying exam is a two-part process that includes a written examination followed by an oral defense. Information detailing the administration and evaluation of both parts of the examination are found in the document Procedures for the PhD Qualifying Examination.

Two-Day Written Examination

The PhD Advisory Committee prepares 5 essay questions emphasizing substantive content and methodological issues. Questions are designed to assess student mastery of content and ability to synthesize knowledge, including theoretical and methodological issues. The student is provided with three exam questions at the beginning of Day 1 and two exam questions at the beginning of Day 2. The student is required to work independently. They may use published resources and scholarly publications to complete examination questions but may not discuss the

examination or seek consultation from any person during the 2-day writing period.

When completed, the PhD Advisory Committee Chairperson distributes the student's written examination to the PhD Advisory Committee members who evaluate the student's responses using the evaluation rubric found in the document Procedures for the PhD Qualifying Examination. They return the completed evaluation rubric to the PhD Advisory Committee Chairperson within 10 days. The PhD Advisory Committee Chair then meets with the student to discuss the evaluation rubrics and plan for the oral defense.

If any committee member evaluates a student response to any written examination question(s) to be unsatisfactory, the student will prepare a remedial written response that will address the committee members' concerns and demonstrate mastery of the material addressed in the question(s) evaluated to be unsatisfactory. The student will return the remedial responses to all committee members at least two business days before the oral defense.

Oral

Defense. Within approximately three weeks after meeting with the PhD Advisory Committee Chair, students will meet with the PhD Advisory Committee for the oral defense. The components of the oral defense are outlined in the document Procedures for the PhD Qualifying Examination. The purpose of the oral defense is to provide the student the opportunity to elaborate on their answers to the written examination and, if applicable, to expand on any remedial responses the student prepared for the Committee. The defense will also be used to plan next steps for the dissertation and provide the Committee the opportunity to give feedback about the student's progress and strengths.

Evaluation. Following the oral defense, the committee will discuss the student's performance on the oral exam and whether weaknesses from the written exam have been satisfactorily addressed. The committee members will then each complete the oral defense evaluation rubric found in the Procedures for the PhD Qualifying Examination. The rubrics are used to determine if the student passes (outstanding or satisfactory) or fails (unsatisfactory) the PhD Qualifying Examination.

If the PhD Advisory Committee determines that the student has passed the PhD Qualifying Examination, the PhD Advisory Committee Chair notifies the Graduate Advisor for Doctoral Programs by submitting the IUS School of Nursing Results of the Qualifying Examination form. The student then submits the Nomination to Candidacy eDoc, which serves as official notification of the passing of the qualifying examination to the IU Indianapolis Graduate School. The student next begins developing the dissertation proposal, seeking IRB approval or exemption, and appointing the Research Committee.

If the PhD Advisory Committee determines the student has not passed the PhD Qualifying Examination, the student will be dismissed from the program.

PhD Dissertation Project (Policy# AFS-56)

PhD in Nursing Science students will follow the guidelines for preparing dissertations set forth in the *Indiana University Indianapolis Graduate School Bulletin*.

Dissertation Proposal Formats

1. The student, with input from the initial Advisory Committee, will decide the type of dissertation format that will be used for the project (traditional vs. 3-paper option).
2. Proposal will include the following three sections regardless of traditional format vs. 3-paper option format.
3. Section 1-Fully developed introduction (if using the 3-paper option the 3 papers/projects should be outlined in this section).
4. Section 2-Fully developed review of literature.
5. Section 3-Fully developed research plan.
6. The fully developed written proposal will be provided to the Advisory Committee at least 2 weeks before the scheduled dissertation proposal defense date.

Dissertation Proposal Defense

1. The student will be required to complete an oral defense of the dissertation proposal with the Advisory Committee members.
2. The committee members need to decide via vote if the student is ready to move forward to the dissertation project based on the written and oral presentation. Decision points would be the following:
3. Approve with no modifications, student can move forward with the dissertation project.
4. Approve with minor modifications, revisions would be approved by the chairperson and the student can then move forward with the dissertation project.
5. Request major modifications, revisions would then be provided back to the Advisory committee for final

Final Dissertation Formats

The student, with input from the initial Advisory Committee, will determine what format to use for the dissertation, using one of the approved options below.

Option #1: Traditional Dissertation Format

1. Formatting of the dissertation must follow requirements and template detailed in the *IU Dissertation & Thesis Format Workshop*. These are found on the [Graduate School](#).

Option #2: Three Publishable Manuscripts Dissertation Format

The three publishable manuscript dissertation will resemble a traditional dissertation in the final format stage and consists of a title page, signed and unsigned acceptance page, copyright page, abstract (including logical connection among the three manuscripts), table of contents, a chapter introducing the study, aims, methods, and the logical connections among the three manuscripts, the three manuscripts, a chapter summarizing the conclusions and implications of the study, appendices, and curriculum vitae.

Formatting of the dissertation should follow requirements detailed in the Indiana University Graduate Office Bulletin

and the *IU Dissertation & Thesis Format Workshop*. These are found on the Graduate Office .

2. The publishable manuscripts will meet the following requirements:
 - a. The documents must be full length manuscripts that are in publishable form (i.e., formatted and ready to be submitted to a peer-reviewed journal) related to the dissertation research. Abstracts, monographs, or short summaries will not be accepted.
 - b. At least one manuscript must report findings from the student's approved empirical dissertation study. The remaining publications can include scholarly reviews of the literature, methods, or theory, policy or other topic approved by the dissertation committee.
 - c. The three manuscripts must be cohesive and demonstrate a logical building the dissertation research. There must be a logical connection between all components of the dissertation, and the manuscripts will be presented in a rational and coherent fashion.
 - d. All manuscripts, whether data-based or not, must be prepared from start to finish under the supervision of at least two members of the Research Committee (also known as Dissertation Committee). Planned content for the three manuscripts, including titles, authorship, and potential journals for submission, must be agreed upon by the Research Committee. Research committee members will be available to the student for guidance while dissertation research is in progress.
 - e. The student must be primary author on these manuscripts and must be able to defend how they are based on the student's own work.
 - f. Evidence of manuscript submission for at least one paper is required prior to final dissertation sign off.
 - g. The remaining manuscripts must be ready to be submitted to refereed journals either in nursing or other disciplines.

Dissertation Final Defense

Students should follow the IU Indianapolis Graduate School policy on timelines and required processes for the final dissertation defense. For rules and guidelines for final submission of the dissertation and completion of all degree requirements, students should refer to graduate.indianapolis.iu.edu/theses-dissertations.

Leave of Absence from the Graduate Program (Policy# AFS-50)

Students must maintain continuous enrollment within their designated graduate program track according to an approved written program plan. Students who are unable to maintain continuous enrollment for health or personal reasons may request a leave of absence from the program.

Qualifying Reasons for a Leave of Absence

- A medical hardship (physical or mental illness -- a chronic condition, or a condition requiring multiple treatments and/or overnight hospitalization).
- To provide care for a family member (spouse, child(ren), domestic partner, child of domestic partner, or parent).
- Death of a spouse, domestic partner, child, or parent.
- Other personal exceptional circumstances will be considered on a case-by-case basis.

Eligibility for Leave of Absence

- Students must have successfully completed at least one semester (a minimum of six credits) in the graduate Nursing program and be actively enrolled and in good standing at the time of request.
- A leave of absence may not be requested retroactively.

Duration of Leave of Absence

- A leave of absence may be requested one time, for up to one year. Students should consult with the academic or faculty advisor regarding the length of time needed for the request.

Academic Ramifications

- The revised program plan for students re-entering the program will depend on course and space availability.
- Students' progress may be delayed due to course changes and/or availability.
- Students may be required to repeat courses or other requirements, or to complete additional work, to ensure adequate preparation for continuing coursework.

Financial Ramifications

- All graduate Nursing students should contact the Office of Financial Aid's liaison for graduate Nursing students and/or their external fellowship and/or scholarship administrator regarding the impact of leave on their student loans and internal or external scholarships and fellowships.
- PhD students receiving a T32 fellowship should contact the IU School of Nursing Office for Research Support.

Student Responsibilities During Leave

- Students on leave should continue to check their IU email account regularly for important updates.
- MSN students expecting to return to clinical coursework should maintain contact with their Track Coordinator regarding clinical placement throughout their leave.
- If a student's plan to return to coursework changes, they should immediately notify their Graduate Advisor.

Protection from Work-Related, Faculty-Guided Research Requirements

- Graduate Nursing students may not serve as a Teaching or Research Assistant during a term in which they are on leave.

Failure to Progress and Dismissal from the PhD Program (Policy# AFS-55)

Students admitted to the PhD Program must maintain continuous enrollment and successfully progress within the program according to their approved program plan of study. Students failing to progress will be dismissed from the program. Failure to progress may occur at any point in the program; during coursework, prior to candidacy, or during the dissertation phase of the program. Conditions constituting failure to progress are listed below.

Grades & GPA

To remain in good standing and be eligible for graduation, students must maintain a cumulative grade point average (GPA) of 3.0 on a 4 point scale throughout the duration of the program. Situations leading to dismissal or probation related to grades and GPA are:

1. Receiving a grade lower than B- in any course will result in probation. Any course in which a student earns a grade lower than B- must be retaken during the next semester in which the course is offered.
2. A second grade of lower than B- will result in dismissal from the program.
3. Earned grades in all courses (including those repeated) remain on the transcript.
4. Receipt of a grade of "F" in any course will result in dismissal from the program, including grades of incomplete (I) that, by university policy, convert to an F after one year if no new grade is filed by the faculty of record for the course.
5. A student whose semester GPA falls below a cumulative GPA <3.0 during any semester will be put on probation. The student must raise their cumulative grade point average of B (3.0) or higher by the end of two semesters. Failure to do so would result in academic dismissal from the program.

Continuous Registration & Progression

Students are expected to follow their program plan of study and register for classes in each consecutive semester, including summer sessions. Situations considered failure of continuous registration / enrollment include:

1. Failure to register for a minimum of 1 credit hour per semester, including summers, unless the student receives written approval from the faculty advisor in consultation with Graduate Advisor Doctoral Programs who forwards a copy of the approval to the PhD-Curriculum and Student Affairs committee (PhD C/SA).
2. Failure to enroll without having been granted a leave of absence will result in dismissal from the program. A formal leave of absence must be requested from the PhD C/SA for absences longer than one semester.
3. Exceeding the time limits of timely progression as specified by the Graduate School Bulletin regarding time to candidacy, time to proposal defense and time to degree completion will

result in dismissal from the program. See the most current Graduate Office Bulletin for details.

Academic Probation

In the event a student fails to progress the student may, at the discretion of the PhD Curriculum and Student Affairs Committee and in consultation with the Associate Dean for Graduate Programs, be placed on academic probation. Students will receive written notification of academic probation and the terms and conditions of the probation will be stated. During academic probation, students must comply with the conditions set forth in the probationary notice. Students who meet all terms and conditions outlined in the letter of probation are reinstated as a student in good standing. Students who do not meet or comply with the probationary terms and conditions will be dismissed from the PhD program.

The full text of these and all other School of Nursing policies can be found by searching for Nursing One at One.IU.edu. Please contact your academic advisor if you need assistance.

Faculty

For a complete listing of IU School of Nursing graduate faculty, please see the [Graduate School's website](#).

Courses

School of Nursing courses

See the [IU School of Nursing Graduate Program Bulletin](#) for a complete list of offerings.

- **NURS-D 602** Responsible Conduct of Research (1 cr.) Students will develop knowledge regarding the responsible conduct of research, including conflict of interest, responsible authorship, policies for handling misconduct, data management, data sharing, policies regarding the use of animals and/or human subjects, and institutional vs. individual responsibilities for scientific integrity. This meets the NIH requirements for instruction of pre- and postdoctoral fellows.
- **NURS-D 607** Theoretical Perspectives of Nursing Science (3 cr.) This course focuses on comparison of philosophical approaches to knowledge development. Emphasis will be on concepts as building blocks of theory and approaches to concept development and analysis for theory development.
- **NURS-D 608** Middle Range Theory (3 cr.) This course focuses on evaluation of theory, the utility of theories in research, and the influence of various theoretical perspectives on research strategies. Emphasis is on midrange, multidisciplinary theories relevant to nursing research.
- **NURS-D 609** State of the Science Seminar (2 cr.) P: NURS-D 607. This course focuses on increasing the students' understanding of how knowledge has developed relevant to their phenomena of interest. Each student will develop skills needed to critically analyze and synthesize relevant literature in the area of a specific phenomenon. Special emphasis is placed on the application on critical analysis and synthesizing skills.
- **NURS-D 701** Nursing Inquiry and Scholarship: Introduction to Doctoral Study (3 cr.) C: NURS-D 607. Examination and development of knowledge,

- skills, and strategies to support critical and creative thinking, identification of research and evaluation interests, socialization, and development of scholarship in nursing.
- **NURS-D 721** Advanced Leadership in Complex Systems (3 cr.) This course focuses on synthesis of leadership research, theory, and organizational models within the context of health systems. Environmental influences, team relationships, partnership models, organizational culture, and achieving performance outcomes are explored and applied. Self-knowledge, strategic vision, risk-taking, and effective communication are discussed relative to complex systems.
 - **NURS-D 743** Building Consensus to Advance Public Health Policy and Strengthen Advocacy (3 cr.) This course prepares nurses and other healthcare professionals to build consensus, engage stakeholders, and influence public health policy. Through collaborative leadership, communication skills, and evidence informed advocacy, students learn to navigate policy and legislative systems while developing strategies to strengthen individual and organizational advocacy efforts at local, state, and national levels.
 - **NURS-D 752** Directed Research Practicum (3 cr.) Students will develop research skills through directed study and supervised research experience. Learning is related to the student's interest area. Multidisciplinary research experience may include, but is not limited to, pilot-testing and evaluating research methods, data collection, data analysis, and secondary analysis of existing datasets relevant to the student's research interests. This course may be taken more than once.
 - **NURS-G 901** Advanced Research (Independent Study) (6 cr.) Individual assignments arranged for doctoral students.
 - **NURS-J 692** Independent Study in Nursing (1-6 cr.) Individual assignments arranged.
 - **NURS-N 502** Nursing Theory I (3 cr.) This course focuses on analyzing the relationships between theory and research for effective translation to practice. Emphasis is placed on selection and evaluation of theories, interprofessional perspectives, and using theory to guide practice and research.
 - **NURS-R 500** Nursing Research Methods I (3 cr.) This course emphasizes using research findings as a basis for clinical and organization decision-making in the delivery of high-quality evidence-based health care. Emphasis is placed on identifying clinical problems and searching, appraising, and synthesizing research evidence for application or, in the absence of evidence, generating new knowledge using research methods. Strategies for disseminating findings across inter-professional contexts and monitoring continuous quality improvement are examined.
 - **NURS-R 505** Measurement and Data Analysis (3 cr.) Principles and applications of scientific measurement, data summarization, inferential statistics, and practical derivations of the general linear model. Considers the research purpose and the phenomenon under study as determinants of measurement techniques and data analysis.
 - **NURS-R 601** Instrumentation and Measurement (3 cr.) P: NURS-R 603, NURS-R 604, or consent of faculty. This course provides an opportunity for the student to develop expertise in developing and testing the psychometric properties of an instrument to measure health-related phenomena. Content focuses on theoretical foundations of measurement, item construction, questionnaire design, and content analysis, item analysis, assessment of reliability and validity, accuracy and precision, and manuscript preparation to report psychometric properties.
 - **NURS-R 603** Foundations of Quantitative Research (3 cr.) This course is an in-depth critique of quality indicators for quantitative research designs. Designs, sampling methods, data collection methods, measurement strategies, and quality of measures are evaluated for threats to internal and external validity. In addition, the logical consistency among problem, purpose, design, data analysis, and conclusions are examined.
 - **NURS-R 605** Design and Applications of Advanced Research Designs/Interventions (3 cr.) P: NURS-R 603, NURS-R 604. Evaluates and applies issues relevant to intervention research and health services research. Content will include intervention dosage, sensitivity, mediators and moderators, and quality assurance and feasibility of intervention delivery. Translational research, multisite research, intent-to-treat, nested designs, and outcome designs will be discussed for application.
 - **NURS-R 607** Advanced Nursing Statistics (3 cr.) This course will cover data handling/management and statistical analyses using the program SPSS. With regards to data handling, students will learn how to input, import, manage, and clean their datasets to prepare for analyses. For analytic techniques, students will learn to visualize data in SPSS using different types of graphs; choose appropriate analyses for the types of variables present in the research project; report summary and descriptive statistics; and conduct Pearson's bivariate correlations, paired and independent samples t-tests, multiple linear regression, ANOVA and ANCOVA within the regression framework, chi-square analyses, and logistic regression analyses.
 - **NURS-R 610** Foundations of Qualitative Research (3 cr.) The focus of this course is on in-depth critique of the quality indicators for qualitative research designs. Designs, sampling methods, data collection methods, and analysis methods are evaluated for credibility, neutrality, consistency and usefulness of findings. In addition, the consistency among research questions, purpose, design, data analysis and conclusions are examined.
 - **NURS-R 613** Grounded Theory Research (3 cr.) P: NURS-R 610 or introductory course in qualitative methods. This course focuses on the methods of grounded theory research within the context of its origins, history and philosophical foundations.
 - **NURS-R 615** Comparative Effectiveness Research and Patient-Centered Outcomes Research (CER/PCOR) (3 cr.) This course provides an overview of comparative effectiveness and patient-centered

outcomes research (CER/PCOR). Topics include history, definitions, and key terms; engaging patients and stakeholders; evidence-based medicine; health technology assessment; policy issues; government and private sector roles and programs; CER/PCOR funding; role of cost and quality; and methods and standards.

- **NURS-R 702** Biological and Behavioral Foundations of Self-Management Interventions (3 cr.) P: NURS-D 607, NURS-R 603, or Permission of Instructor. This course provides in-depth analysis of the theoretical and research literature that provides evidence for biological and behavioral factors that influence self- and family management. Students will critically evaluate theories/models applicable to self- and family-management and complete an in-depth analysis of self-management interventions relevant to their area of interest.
- **NURS-R 703** Symptom Science: Models, Methods, and Measures (3 cr.) P: NURS-D 607, NURS-R 603, or Permission of Instructor. This course focuses on models, methods, and measures used in symptom science. The NIH Symptom Science Model and core symptoms of cognition, depression, fatigue, pain, and sleep will be examined. Students will critically evaluate scientific literature and conduct an in-depth evaluation of one symptom related to their area of research interest.
- **NURS-R 704** Developing Grant Applications for Health Sciences (3 cr.) In this course, students develop beginning grantsmanship skills by understanding the process of successful grant writing and common components of grant applications. Students will collaborate with research mentors/teams to develop substantive content of a grant application that has potential for funding. Students will participate in peer review and critique.
- **NURS-R 899** Dissertation in Nursing (1-9 cr.) P: All doctoral coursework and the qualifying exam must be completed. Dissertation research is facilitated through individualized research mentoring. Each semester, goals/objectives and a timeline for work to be accomplished are mutually determined by the student and chair. The student and dissertation chair meet regularly and dissertation committee members are involved as needed to ensure consistent progress.
- **NURS-R 900** Continuation in Study or Thesis (1 cr.) Following enrollment in NURS-R 899, the student must enroll every semester and first summer session in NURS-R 900 until the dissertation has been completed.
- **NURS-T 800** Preparing Future Faculty (2 cr.) P: Students should have completed one year of doctoral level coursework. This course helps students develop competencies as doctorally prepared educators in academic and other complex organizations. Course concepts include functioning within the educational environment, understanding the relationship between teaching, research/scholarship and service and preparing to be a doctorally prepared member of the faculty.
- **NURS-W 540** Writing for Publication in Health Sciences (3 cr.) This course is for graduate students in health sciences focusing on preparing a research

or scholarly works manuscript for publication. Content takes students through the process of journal selection, manuscript preparation, and submission. Emphasis is placed on peer review, contemporary issues in publishing, and publication ethics.

Pharmacology

School of Medicine

Departmental E-mail: PHTXinfo@iu.edu

Departmental URL: medicine.iu.edu/biochemistry-molecular-biology-pharmacology

Curriculum

Degrees Offered

Master of Science Pharmacology

Doctor of Philosophy in Pharmacology

Master of Science Pharmacology Degree Admissions Requirements

We accept MS of Pharmacology students on a very limited basis. These degree offerings are reserved for students who have started on the PhD course of study and who, for a variety of reasons, find they must end their studies before they complete their Doctorate.

Students desiring an MS of Pharmacology must first find a faculty member in the Department who is willing to act as mentor and provide financial support. Only after the student obtains this consent from a faculty member in the department would the student's application be evaluated.

The student is responsible for contacting directly a faculty member s/he is interested in working with to arrange the research prior to submitting an application to the program. If an arrangement for master's-level training and support is secured, the faculty member must notify the Graduate Advisor in the Department of Pharmacology and . At that point, special arrangements would be made to evaluate the student's application to start the degree in the following fall semester.

Degree Requirements

Students receiving a MS in Pharmacology are required to take at least 30 credits with a minimum grade allowed of B. The requirements are as follows:

- Required Courses for Major (15 credits)
 - GRDM-G 747 PRINCIPLES OF PHARMACOLOGY
 - GRDM-G 748 PRINCIPLES OF TOXICOLOGY 1
 - GRDM-G 745 FUNDAMENTALS OF INTRACELLULAR SIGNAL TRANSDUCTION
 - PHAR-G 751 ADVANCED CONCEPTS IN CYTOSOLIC AND NUCLEAR SIGNAL TRANSDUCTION
 - GRDM-G 855 EXPERIMENTAL DESIGN AND RESEARCH BIostatISTICS
 - PHAR-F 830 SEMINAR IN PHARACOLOGY AND TOXICOLOGY
 - GRDM-G 740 TRANSLATIONAL SYSTEMS PHYSIOLOGY AND PHARMACOLOGY

- GRDM-G 505 THE RESPONSIBLE CONDUCT OF RESEARCH
- GRDM-G 702 ENTERING BIOMEDICAL RESEARCH
- GRDM-G 507 REAGENT VALIDATION AS A MEANS FOR ENHANCED RESEARCH REPRODUCIBILITY
- Science Communication Course - Choose 1
 - COMM-C 534 DISTILLING YOUR MESSAGE
 - COMM-C 533 IMPROVISATION FOR SCIENTISTS
 - ENG-W 533 SCIENCE WRITING FOR PUBLIC READERS
- Research (12 Credits)
 - PHAR-F 825 RESEARCH IN PHARMACOLOGY

Doctor of Philosophy in Pharmacology Program Description

Indiana University School of Medicine offers a PhD degree in pharmacology that allows students to develop individually tailored programs of study and to pursue research in drug discovery, pharmacology, cancer biology, neurobiology, immunology, microbiology and toxicology. Our doctoral program develops independent investigators in pharmacology. Using molecular biology, biochemistry, chemistry and physiology techniques, students are required to demonstrate proficiency in both conceptual and technical facets of modern biomedical research and to perform meritorious original research on a significant problem in pharmacology. The study of pharmacology requires a diverse background in biological sciences, including biochemistry, cellular biology, molecular biology, physiology, genetics and neuroscience. This enables medical scientists to integrate the knowledge of biological systems with the effects of pharmacological agents.

Admissions Requirements

The Pharmacology Ph.D. program participates in an "open enrollment" system named The Indiana University School of Medicine BioMedical Gateway (IBMG) Program. The IBMG Program provides a shared first year experience for all of the School of Medicine biomedical science pre-doctoral (Ph.D. program) students. The link for the IBMG program is: <https://medicine.iu.edu/graduate-degrees/phd/indianapolis>.

Degree Requirements

All Pharmacology Ph.D. students are required to take 28 hours of coursework (of that 6 hours will be rotations); an additional 62 hours will be research and seminar, for a total of 90 hours. Other requirements for completing the Ph.D. program are (1) publishing at least one first-author original research paper, or submitting a statement from the student's research committee indicating that these will be forthcoming; and (2) achieving two of the following: (a) submitting a grant application, (b) co-authoring a second research paper or review article, and (c) presenting an abstract at national or international meeting. The curriculum is as follows:

- Required Courses for Major (12 credits)

- GRDM-G 747 PRINCIPLES OF PHARMACOLOGY
- GRDM-G 748 PRINCIPLES OF TOXICOLOGY 1
- GRDM-G 745 FUNDAMENTALS OF INTRACELLULAR SIGNAL TRANSDUCTION
- PHAR-G 751 ADVANCED CONCEPTS IN CYTOSOLIC AND NUCLEAR SIGNAL TRANSDUCTION
- GRDM-G 855 EXPERIMENTAL DESIGN AND RESEARCH BIOSTATISTICS
- GRDM-G 505 THE RESPONSIBLE CONDUCT OF RESEARCH
- GRDM-G 702 ENTERING BIOMEDICAL RESEARCH
- GRDM-G 507 REAGENT VALIDATION AS A MEANS FOR ENHANCED RESEARCH REPRODUCIBILITY
- PHAR-F 850 EXPERIMENTAL DESIGN AND GRANT WRITING IN PHARMACOLOGY AND TOXICOLOGY
- Science Communication Course (choose one):
 - COMM-C 534 DISTILLING YOUR MESSAGE
 - COMM-C 533 IMPROVISATION FOR SCIENTISTS
 - ENG-W 533 SCIENCE WRITING FOR PUBLIC READERS
- Seminar (4 credits minimum)
 - PHAR-F 830 SEMINAR IN PHARMACOLOGY AND TOXICOLOGY
- Research Credits (56 credits minimum)
 - GRDM-G 718 RESEARCH IN BIOMEDICAL RESEARCH (take at most 6 credits)
 - GRDM-G 803 RESEARCH (take at most 9 credits)
 - PHAR-F 825 RESEARCH IN PHARMACOLOGY
- Elective (if appropriate)
- Minor (12 credits): Students generally minor in life sciences, but have the option to minor in any program approved by the IUSM Graduate Office. Students should consult the Graduate Student Advisor in planning their program to ensure all major *and* minor requirements are met.

Research Committee

The student chooses a research committee with approval of the program director upon declaring Pharmacology as their Ph.D. program.

Qualifying Examination

Written and oral, over concepts and research in pharmacology.

Final Examination

Oral defense of dissertation.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **PHAR-F 818 Principles of Medical Pharmacology (3 cr.)** P: A course in basic biology or physiology equivalent to BIOL K324 or BIOL 501. Introductory course in pharmacology and primarily for senior undergraduate students. The course provides an overview of the molecular basis of drug action and pharmacological properties of several of the major drug groups used in medical science.
- **PHAR-F 602 Pharmacology: Lecture (5 cr.)** P: BIOC B800, PHSL F613, F614. Mode of action of drugs as a basis for therapy.
- **PHAR-F 801 Introduction to Research in Pharmacology and (1-3 cr.)** Application of basic laboratory methods to pharmacological problems. Consideration of theoretical principles, instrumentation, and applications.
- **PHAR-F 804 Introduction to Pharmacology and I (3 cr.)** **Not currently being offered.** This course will teach the fundamental principles of pharmacology and for the beginning graduate student, as an introduction to the discipline.
- **PHAR-F 809 Neuropharmacology (3 cr.)** P: F598 or F602 and BIOC B835, or permission of instructor. **Not currently being offered.** Drugs which affect the nervous system, with particular emphasis on their central action. Although neurochemical effects will be stressed, evidence from neurophysiology and behavior will also be considered.
- **PHAR-F 812 Research in (1-12 cr.)** Independent laboratory research to fulfill dissertation requirements for either a master's or a doctorate degree in . Students must be enrolled in graduate studies in the Department of Pharmacology and to register for this course.
- **PHAR-F 813 Clinical Pharmacokinetics (3 cr.)** Offered Spring of even numbered years. Design and complete mathematical analysis of pharmacokinetic studies in humans. The clinical utility of pharmacokinetics will be stressed, but the course will also have definite value for those involved with drug studies in animals.
- **PHAR-F 816 Clinical (3-5 cr.)** P: P598 or F602. Signs and symptoms resulting from common poisons and drugs. Chemical analyses as aids in diagnosis.
- **PHAR-F 819 Chemical Carcinogenesis (3 cr.)** This course examines the biochemical and molecular mechanisms by which chemicals cause cancer. Emphasis will be on the uptake, metabolism, cellular targets and specific stage(s) of the cancer process that are affected by chemical carcinogens. Discussions will expand on the basic principles of carcinogenesis as they apply to the latest advances in the field. **Not currently being offered.**
- **PHAR-F 820 Cancer Chemoprevention (3 cr.)** **Not currently being offered.** This course will examine the biochemical and molecular mechanisms of natural and synthetic cancer chemopreventive agents.
- **PHAR-F 825 Research in Pharmacology (1-12 cr.)** Independent laboratory research for fulfilling dissertation requirements.
- **PHAR-F 826 Seminar in (1 cr.)** Literature and research reports by students and staff.
- **PHAR-F 830 Seminar in Pharmacology (1 cr.)** Literature and research reports by students and staff.
- **PHAR-F 835 Molecular Mechanisms of Drug Action (3 cr.)** **Not currently being offered.** Biochemical mechanisms underlying drug actions and reactions including toxicologic effects of drugs will be covered, with emphasis on molecular mechanisms involving drug receptor interaction, the actions of drugs and hormones on regulatory mechanisms in various disease states.
- **PHAR-F 836 Physiological Disposition of Drugs (3 cr.)** Factors affecting the absorption, distribution, metabolism, and excretion of drugs will be discussed in terms of environmental, biochemical, and physiochemical parameters. Pertinent literature will be reviewed and special problems discussed.
- **PHAR-F 838 Cellular and Molecular (3 cr.)** This course examines the cellular mechanisms that mediate xenobiotic toxicity at the cellular, biochemical and molecular level. The course emphasizes mechanisms through which toxic chemicals act to evoke cell injury and cell death.
- **PHAR-F 840 Advanced Topics Pharmacology (2-5 cr.)** P: F598 or F602. Advanced studies of pharmacodynamic mechanisms in cardiovascular, central nervous system, and renal pharmacology and . Experimental design related to recent advances and current hypotheses concerning drug action and toxicity. May be repeated three times for credit.
- **PHAR-F 841 Advanced Topics in (1-3 cr.)** This course will involve a series of lectures and discussions on new advances in . The course will focus on metabolic, cellular, and molecular mechanism by which toxic agents produce injury.
- **PHAR-F 850 Experimental Design Analysis/Grant Writing (1 cr.)** P: F598 or F602. This course presents experimental methods and data analysis used in pharmacological and toxicological experimentation. Emphasis will be on experimental design.
- **GRAD-G 743 Fundamentals of Electrical Signaling and Ion Channel Biology (1 cr.)** Experimental basis for cellular and molecular concepts of electrical excitability and membrane transport through ion channels. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide current "facts" to memorize.
- **GRAD-G 747 Principles of Pharmacology (1 cr.)** This course is intended for incoming basic science doctoral graduate students in the School of Medicine Pharmacology & programs or other interested graduate students. This course covers the basics of drug-receptor interactions, drug metabolism, pharmacogenetics, and pharmacokinetics. This

course will include PowerPoint presentations and student presentations.

- **GRAD-G 748 Principles of 1 (1 cr.)** This course will present the fundamental concepts of necessary to understand the effects of chemicals on human health. Cellular and molecular mechanisms involved in toxic responses elicited by pharmaceutical and environmental agents, activation and detoxification of drugs and chemicals, and the principles of carcinogenesis and mutagenesis will be presented.
- **GRAD-G 754 Principles of 2 (1 cr.)** Xenobiotic-induced target organ toxicity will be discussed with respect to the biological and/or chemical factors that influence toxicity at a tissue site, the modes of action for producing damage, and the methodology used to measure injury. This course is designed to provide a foundation for understanding the complex interactions between toxicants and biological systems from a basic science approach.
- **GRAD-G 755 Principles of 3 (1 cr.)** The effects associated with specific classes of chemicals, including chemical agents that either demonstrate a great chance for injury and/or pose significant potential for human exposure will be presented. The chemical classes covered will include selective metals, solvents and alcohols, pesticides, plastics, and gases.
- **PHAR-F 808 Myocardial Biology (3 cr.)** The cellular biology of muscle, with emphasis on the regulation of the internal ionic milieu and its effect on function of cardiac cells. The contractile proteins and the ion transport systems, Na⁺, K⁺ -ATPase, sarcoplasmic reticulum, and mitochondria will be considered in detail. **Not currently being offered.**
- **GRAD-G 745 Fundamentals of Intracellular Signal Transduction of Neurons (2 cr.)** Experimental basis for cellular and molecular concepts of intracellular signaling cascades. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide current "facts" to memorize.
- **PHAR-G 751 Advanced Concepts in Cytosolic and Nuclear Signal Transduction (2 cr.)** This course is designed to give graduate students in biological sciences a state-of-the-art education in cellular signaling mechanisms and the methodology used to study them. Landmark and breaking scientific journal articles.

Philanthropic Studies

Lilly Family School of Philanthropy

Departmental URL: philanthropy.indianapolis.iu.edu

Curriculum

Located on the IU Indianapolis campus, the school offers master's and doctorate degrees. We value a multi-disciplinary approach to understanding philanthropy, with courses in the humanities, social sciences, and professions. The school's research and learning environment includes Lake Institute on Faith & Giving, the Women's Philanthropy Institute, the Mays Family Institute on Diverse Philanthropy, The Fund Raising School, the

Research Department, the Payton Philanthropic Studies Library, and the Ruth Lilly Special Collections Archives.

Degrees Offered

Master of Arts in Philanthropic Studies (on-campus and online)

Ph.D. in Philanthropic Studies

Ph.D. Minor in Philanthropic Studies

Graduate Certificate in Philanthropic Studies (on-campus and online)

Graduate Certificate in Philanthropic Fundraising (online only)

Master of Arts in Philanthropic Studies

Program Description

The Lilly Family School of Philanthropy's degree programs bring together an understanding of how philanthropy works with why people give. The school emphasizes a comprehensive approach to the study of philanthropy in society that gives you the knowledge and understanding to be active in the nonprofit field. This broad approach gives you more choices throughout your life to pursue your passions and improve your community locally or globally.

New courses and degree programs develop rapidly. For up-to-date information, please contact the Lilly Family School of Philanthropy (philanthropy.indianapolis.iu.edu).

Admission Requirements

The Master of Arts in Philanthropic Studies is a gateway to understanding the social, cultural, political, and economic roles played by philanthropy and nonprofit organizations, and facilitates broad understanding that prepares graduates for leadership practice within the nonprofit sector. Students gain experience in understanding and applying cutting-edge research and develop critical thinking skills about the complex issues confronting the nonprofit sector.

This 36-credit-hour graduate program includes 27 hours of core course work, 9 hours of electives, OR a 9-hour thesis option in lieu of electives.

Application Deadlines

Summer/Fall Admission Deadlines:

- **On-campus—April 1** (applications accepted through August 15 as space permits)
- **Online—June 1** (applications accepted through August 15 as space permits)

Spring Admission Deadlines:

- **On-campus—October 15** (applications accepted through December 15 as space permits)
- **Online—October 15** (applications accepted through December 15 as space permits)

Admission Requirements

Prior Academic Work: A bachelor's degree from an accredited college or university is required with a minimum of a 3.0 overall grade point average (on a scale of 4.0), and a minimum of a 3.0 average in your major field.

- Official undergraduate and graduate transcripts should be mailed to: Student Services, Lilly Family

School of Philanthropy, University Hall, Suite 3000,
301 University Blvd., Indianapolis, IN 46202.

Graduate Record Examination General Test: GRE

Scores are NOT required for admission into the Master of Arts in Philanthropic Studies. Applicants may submit GRE or comparable proficiency test scores (i.e., GMAT, LSAT). Results from the Graduate Record Examination should be taken within the last 5 years.

- Please use the IU Indianapolis code R1325

English Proficiency: If your prior degree was completed outside of the US, you'll need to [demonstrate English Proficiency](#).

Recommendations: Three letters of recommendation to the Admissions Committee are required. Preference will be given to those candidates who can demonstrate ability to successfully perform academic work. In selecting your recommenders, try to select those people who can best speak to indications of your ability to successfully do academic work. If a recommender is not in an academic environment, encourage **them** to assess your knowledge, skills, and abilities as they relate to your ability to do academic work.

Prepare to submit your recommenders' contact information within the application; an email will be sent to your recommenders' shortly after their contact information is submitted. Letters of recommendation submitted directly from applicants will not be accepted.

Statement of Purpose: Preference will be given to those candidates whose goals and interests, broadly speaking, match those of the Master of Arts in Philanthropic Studies and its curriculum. Within your Personal Statement, be prepared to answer one of these questions in approximately 500-750 words:

- Describe your professional goals in the field of philanthropy. Why is the Lilly Family School of Philanthropy the best fit to help you achieve your goals?
- Explain a significant challenge in philanthropy today. How do you see yourself addressing this challenge? How do you expect your education with the Lilly Family School of Philanthropy to further your professional preparation?
- Résumé/CV: Please attach a résumé or CV to your application when applying.

Program Requirements

MA students in this program are expected to complete at least 36 credits with the following courses:

Core Courses

- PHST-P 521 THE NONPROFIT AND VOLUNTARY SECTOR
- PHST-P 524 CIVIL SOCIETY IN COMPARATIVE PERSPECTIVE
- PHST-P 535 LAW OF NONPROFIT ORGANIZATIONS
- PHST-P 556 GRANT MAKING AND THE ROLE OF FOUNDATIONS
- PHST-P 558 PRINCIPLES AND PRACTICES OF FUNDRAISING

- PHST-P 590 INTERNSHIP IN PHILANTHROPIC STUDIES
- PHST-P 530 NONPROFIT ECONOMY AND PUBLIC POLICY
- PHST-P 515 HISTORY OF PHILANTHROPY
- PHST-P 532 APPLYING ETHICS IN PHILANTHROPY

Thesis/Non-Thesis Option: 9 credits

Thesis Option: 9 credits

- PHST-P 600: MA Thesis in Philanthropic Studies

Non-Thesis Option: 9 credits

- PHST-P 530 TOPICS IN PHILANTHROPIC STUDIES
- PHST-P 534 GENDER AND PHILANTHROPY
- PHST-P 536 MUSLIM PHILANTHROPY
- PHST-P 537 MUSLIM HUMANITARIANISM
- PHST-P 538 MUSLIM PHILANTHROPY CAPSTONE
- PHST-P 539 RELIGION AND PHILANTHROPY
- PHST-P 555 READINGS IN PHILANTHROPIC STUDIES
- PHST-P 559 DONOR BEHAVIOR IN MAJOR AND PLANNED GIVING
- PHST-P 560 INSTITUTIONAL FUNDRAISING

Ph.D. in Philanthropic Studies

Our doctoral program trains future scholars and professionals in conducting original research on philanthropy and related topics. The Ph.D. program engages both humanities and social science theory to prepare you to make an original contribution to the field.

Doctoral students have examined a wide range of topics including the history of philanthropy, why people give, the role of nonprofits in policy, the effectiveness of foundations and faith-based initiatives, and the role of social movements in society.

Students take two years of coursework on campus, pass qualifying exams, defend a dissertation proposal, then research, write, and defend a final dissertation. You should plan to complete coursework, pass exams, and defend your dissertation proposal within three years of full-time enrollment.

All doctoral students submit annual progress reviews to the director of graduate programs and their research committee chair.

Admission eligibility

Students [apply online](#) through the IU Indianapolis Graduate School. You must have a master's degree in a field relevant to philanthropic studies. Other requirements include a statement of research interest that identifies [Lilly Family School of Philanthropy faculty](#) with whom you seek to work, a résumé, undergraduate and graduate school transcripts, standardized test scores such as the GRE, and letters of recommendation that attest to the your ability to conduct original research.

Graduate Record Examination General Test: Applicants are expected to demonstrate an appropriate level of proficiency on the GRE or a comparable proficiency test

(i.e., GMAT, LSAT). Results from the Graduate Record Examination taken within the past five years are required.

- Please use the IU Indianapolis code R1325

English Proficiency: If your prior degree was completed outside of the US, you'll need to [demonstrate English Proficiency](#).

Ph.D. outcomes

We admit approximately four full-time students annually to the doctoral program. Doctoral students complete their degree in an average of 6 years. One hundred percent of Ph.D. graduates who sought employment were employed in tenure track (75 percent) or high-level philanthropic professional positions (25 percent) upon graduation.

Financial support

Ph.D. students, who are enrolled full-time, receive financial support in the form of tuition scholarships, health insurance, and an assistantship stipend for up to four years. Tuition scholarships are 88 percent of tuition for in-state students and 95 percent of tuition for non-resident students. To be eligible, you must work 20 hours per week as a research assistant or teaching assistant, attend monthly doctoral student meetings, and attend regular research seminars.

Requirements

Students must complete at least 90 credit hours, 30 of which often can transfer from a completed master's degree program. Of the remaining 60 credit hours, 42 credit hours are coursework and 18 hours are dissertation research credits. Course work includes six core courses, three methodology courses, four courses in your minor field, and one elective.

Core Courses (15 credits)

- PHST-P 660 ETHICAL, MORAL, AND RELIGIOUS ASPECTS OF PHILANTHROPY
- PHST-P 662 HISTORICAL AND CULTURAL PERSPECTIVES OF PHILANTHROPY
- PHST-P 665 NONPROFITS AND PHILANTHROPY IN SOCIETY 2
- PHST-P 669 PHILANTHROPY AND NONPROFITS 3
- PHST-P 790 ADVANCED RESEARCH SEMINAR IN PHILANTHROPIC STUDIES

Dissertation (18 credits)

- PHST-P 890 DISSERTATION

Research Methods (9 credits)

- PHST-P 690 RESEARCH IN PHILANTHROPIC STUDIES
- PHST-P 602 QUALITATIVE METHODS FOR THIRD SECTOR RESEARCH

Electives (6 credits)

Minor Requirements (at least 12 credits): You will identify your minor field of study and minor field advisor within your first year on campus, and pursue a variety of minor fields, including anthropology, business, economics, higher education, history, nonprofit management,

philosophy, political science, religious studies, and sociology.

Additional Requirements

Qualifying Exams

Exams are in written format and consist of three questions, offered in succession over three consecutive weeks: general/core, humanities (history or ethics), and social sciences. Answers to each exam are approximately 20 pages plus bibliography and endnotes. Two faculty members design and grade each exam; students have 48 hours to prepare and submit each exam. Students submit exams without names so that faculty exam graders do not know whose exams they are grading.

Ph.D. Minor

The Ph.D. minor in Philanthropic Studies enables the advanced graduate student in other departments to take an organized body of courses focusing on the history, culture, and values of philanthropy, defined broadly as "voluntary action for the public good." The Ph.D. minor will be available to doctoral students in other departments and schools of Indiana University, and will be offered through the University Graduate School. The minor field advisor must be a philanthropic studies faculty member.

Requirements for the doctoral minor will include 12 credit hours, which usually will comprise four three-credit, graduate-level courses. A grade of B or higher (not B-) must be earned in each course counted toward the minor.

Courses will normally include those listed below. The student is required to include Philanthropic Studies P521 (or SPEA V521), which is a prerequisite for other philanthropic studies courses. The student must take at least one of the doctoral core courses and two additional graduate philanthropic studies courses.

Courses other than those listed (e.g., special topics courses) may also be accepted toward completion of the requirement, if written consent to count such courses toward the minor is obtained in advance from the Philanthropic Studies Director of Graduate Programs. Because the subject of philanthropy is inherently interdisciplinary, no more than two courses may be taken in any one department.

No more than six credit hours of work transferred from another university may be applied toward this requirement, and such credit must be approved by the Philanthropic Studies Director of Graduate Programs.

Students will be required to answer a philanthropic studies question for their qualifying exams, if their principal department permits a minor field question. Such questions will be supplied by the minor field advisor.

Students intending to pursue the doctoral minor should declare such intentions in a letter addressed to the Philanthropic Studies Director of Graduate Programs.

Upon completion of the course work and a minor field question (if applicable), the student's philanthropic studies advisor will attest to the successful completion of the minor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

Core Courses

- PHST-P521 Nonprofit and Voluntary Sector:** This course is an introduction to the nonprofit sector and the role of voluntary action and philanthropy (broadly conceived) in societies, especially (but not exclusively) in the United States. It provides a broad overview of size, scope, and functions of the nonprofit and voluntary sector, as well as the diverse rationales for why such a sector exists. We will explore the historical origins of philanthropy, the reasons why people and institutions give and engage with nonprofit organizations of various types, and how the voluntary sector advances innovations and fosters social change, among other topics. We will focus throughout on the evolving relationship of this sector to the state and the market, and we will regularly connect the course material to current debates in the field or examples from real nonprofit and philanthropic practice.
Overall, the primary goal of this course is to help you become "philanthropically literate" – that is, familiar with the critical and foundational theories, concepts, controversies, research, and terminologies of the field of philanthropic studies – in preparation for continued study in this field. The course is explicitly interdisciplinary and expansive in its purview. We focus on a broad social sector and universal type of action, rather than on the dynamics of organizational management or other elements of professional practices.
- PHST-P524 Civil Society in Comparative Perspective:** This course explores civil society within diverse cultural perspectives. Civil society includes organizations and activities that are not directly managed by or associated with governments. The course addresses questions such as: What constitutes civil society? What are its geographic and cultural contexts? How does civil society relate to social and economic issues, such as poverty and wellbeing? The course will begin by exploring the concept of civil society as it was historically developed within Western contexts. Then the course will progress into the globalization of civil society by examining cross-cultural comparisons across countries. Next the course will advance into within-country studies of states, counties, neighborhoods, groups, associations, and social networks.
- PHST-P535 Law of Nonprofit Organizations:** This course examines and explains the legal issues of nonprofit and tax-exempt organizations. It also serves to introduce legal reasoning to masters' candidates in the Philanthropic Studies program. Specific topics will include:

Formation, operation, and governance of nonprofit organizations

Duties and liabilities of officers and directors

Tax-exempt status for public benefit and mutual benefit organizations

Lobbying and political campaigning

Private foundations, donor advised funds and supporting organizations

Inurement, private benefit, and intermediate sanctions

Commercial activity and unrelated business income tax

Charitable giving and solicitation

Oversight by state attorney general and Internal Revenue Service

Special issues for membership organizations

- PHST-P556 Grant Making and the Role of Foundations:** This course examines the influential role philanthropic foundations play as major funders and drivers of social change. Students will explore different types of foundations, evaluate how foundations define and measure effectiveness, and examine issues of accountability, fairness, participation, and diverse lived experiences in philanthropic work. The course also introduces students to the perspectives of both foundation staff and grantees while encouraging critical analysis of how foundations operate in practice.
- PHST-P558 Principles and Practices of Fundraising:** This course covers salient aspects of fundraising by nonprofit organizations - its core values, preparing a case, techniques and strategies, assessing sources of support, engagement of human resources, and process management. The course addresses theory to undergird practice, examination of current practice and practice standards, and ethical problems in fundraising.
- PHST-P590 Practicum:** Directed off-site study provides the culminating experiential learning opportunity for students to integrate graduate-level knowledge outside the classroom. Off-site study may include any of the following: professional work within a nonprofit organization, board service for a nonprofit organization, study abroad that includes volunteering, community service, fieldwork, or another philanthropic context such as a for-profit entity's corporate social responsibility department. The directed off-site study provides a crucial bridge between the classroom, real-world issues in philanthropy, and skill development in a professional setting. Students work with a partner organization and with me to develop a meaningful experience in areas of interest such as: program development, advocacy, convening, special events, fundraising, grantmaking, marketing, communications, volunteer management, board development, or strategic planning.
- PHST-P515 History of Philanthropy:** This course examines traditions of giving and receiving charity and philanthropy in the modern era. It takes a comparative approach to giving including different historical contexts and traditions. Among the topics covered will be donor motivations, definitions of need, identity formation, and philanthropy, politics and social change.
- PHST 533 Nonprofit Economy and Public Policy:** Students examine the role of nonprofit organizations (universities, churches, hospitals, orchestras, charities, day care, research, nursing homes) in mixed economies. Public policy controversies such as regulation of fundraising, antitrust against

universities, “unfair” competition with for-profit firms, and the tax treatment of donations are considered.

- **PHIL-P542/PHST 532 Ethics and Values in Philanthropy:** This course reflects an inquiry into the ethics and values of philanthropy rooted in a general understanding of philanthropy, as voluntary action for the public good, as an ethical ideal. Students consider philanthropic activity in light of this ideal.

Elective Courses

- **PHST-P534 Gender and Philanthropy:** This course provides a broad overview and deeper understanding of gender and philanthropy, focusing on topics such as gender differences in giving and volunteering, women's role in the philanthropic sector, and the gender gap in nonprofit leadership. We will also discuss how we can apply this knowledge to the nonprofit sector today.
- **PHST-P559 Donor Motivation and Planned Giving:** This course will develop students' understanding of the motivations and behaviors of high net worth individuals, and their ability to plan effective strategies for donor identification, cultivation/education/ engagement, solicitation, and stewardship in support of major and planned gifts. Special attention will be paid to the law offundraising regarding major and planned giving as well as ethical standards of practice.
- **PHST-P560 Institutional Fundraising:** This course examines various types of institutional donors (corporations, foundations, federated organizations, etc.) and the design and implementation of effective fundraising strategies to engage them. Revenue generation from alternative sources of income (i.e., venture philanthropy, social entrepreneurship) will also be explored to enhance students' understanding of the changing dynamics of the fundraising landscape.
- **PHST-P550 Community Foundations:** For more than 100 years, community foundations, those organizations that raise and distribute resources from a long-term endowment for the general purposes of a defined geographic place, have played key roles in the long-term stewardship of local philanthropic assets, mobilizing and guiding donors, partners in collaborative governance, and social change activists. Today there are about 1000 community foundations in the United States who represent unique manifestations of these complementary and sometimes conflicting roles. In 2023, all community foundations are facing a variety of pressures, including growing critiques of institutional philanthropic, growing community polarization, and changing public policies community foundations that pressure community foundation leaders to re-think their values and practices. In that light, this course will explore the context and management of community foundations*—where the field has it been, where is it going, and how will it get there. The course will begin with a history of community foundations in the United States and the forces affecting community philanthropy today. Centering on the intersecting themes of community leadership, and social change, our course will include discussions of topical issues to a field in transition, including: 1). Stewardship of diverse resources 2). Donor services 3). Community leadership and 4). Social change.
- **PHST-P539 Religion and Philanthropy:** This course explores three relationships between people's religious traditions and their philanthropic ideas and activities: 1) how diverse religious traditions have shaped distinctive philanthropic practices, 2) how political, economic and social forces have structured religious philanthropy, and 3) how competing visions of good lives and a good society have played out in the give and take of religious philanthropy. In examining the normative models of giving and service through a variety of religious traditions, we will analyze how religious narratives, practices, teachings and authorities have shaped people's generosity and humanitarianism. In studying religious philanthropy in particular historical contexts, we will explore how religious philanthropy has been influenced by secular states and market economies, transforming religious traditions and communities along the way. In observing the tensions between the purposes of givers and takers, we will locate religious philanthropy in the world of social action to assess claims about the uniquely selfless, altruistic, or civic nature of religious philanthropy.
- **PHST-P530 The Effectiveness of Philanthropy:** What do we know about the experience of receiving help? What is it like for someone to walk in the door of a homeless shelter, a legal aid clinic, or a job training program and ask for help? How much do we really know about the experiences of those who motivate us to start a nonprofit, donate money, or volunteer time? While we have spent a lot of time studying those who give and the experience of those giving, we know far less about the experience of those receiving this help. This course draws on literature from anthropology, sociology, social psychology, and political science to examine the experience of receiving help. We will tease out when giving help is effective, why it's often ineffective or less effective than it could be and then consider the implications for nonprofit management and public policy.
- **PHST-P530 Philanthropy and Public Policy: The European Context (Study Abroad):** The study-abroad program provides students with a first-hand learning experience in philanthropy and public policy. Students will have the opportunity to learn from German and Dutch professors, researchers, policy-makers, and leaders from the nonprofit sector. Students will visit state and federal agencies, local nonprofit organizations, think tanks, and philanthropic foundations.
- **PHST-P540 DATA FOR GOOD:** How can data be harnessed for good? This is a class about how to use analytics to help humanity, engage communities, improve nonprofit impacts, invest grant dollars strategically, and share data ethically and equitably with the producers of this treasured resource: everyday people. Students will hone their data literacy skills by learning about a variety of data forms, understanding their significance for lessening complex social problems, and critically considering their unintended consequences. A key aspect of

the course is attention to data visualization and narration: telling compelling stories with data that are designed to improve society and help communities to flourish.

- **PHST-P 530 PHILANTHROPIC LEADERSHIP:** This graduate course examines established leadership theories in the context of the philanthropic sector. Students are invited to reflect upon the key themes of each module to build greater awareness and development of their leadership traits and skills. In addition, course assignments will allow students to apply each module's key themes to real-world examples. The learning materials of this course also will remain useful throughout the student's academic and professional careers, providing a foundation for continual learning, development, and application of leadership skills
- **PHST-P530 VOLUNTEER AND BOARD ENGAGEMENT:** This course is all about the "why" and "how" of volunteer engagement and board leadership. We'll dive into the essential theories of volunteering while building the practical skills you need to lead. By the end, you'll know how to design strategic frameworks that keep organizations accountable, sustainable, and focused on making a real mission impact.
- **PHST-P602 Qualitative Methods in the Third Sector:** This course will examine the organization, design, and execution of multi-method, qualitative research with a special emphasis on third sector contexts. Specific tools for research, such as observation, interview, case study design, and document analysis will be examined through course readings, discussion, and the conduct of student projects.
- **PHST-P660 Ethical, Moral, and Religious Aspects of Philanthropy:** This doctoral seminar explores select moral languages of ethics and global religious traditions to understand and evaluate different ethical ideals of public good and human flourishing as well as the ways in which individuals and diverse publics seek to advance their ideals through philanthropy, nonprofits, and other associated activities, often in partnership with government. We will explore various moral languages to imagine, justify, and contest ideas that intersect private virtues, public benefit, and relational and community life. Emphasis is placed on the ethics of philanthropy in comparative perspective, social and religious aspects in global context, and moral issues raised in philanthropic practice.
- **PHST-P662 Historical and Cultural Perspectives on Philanthropy:** This seminar provides a graduate-level introduction to the history of philanthropy and the nonprofit sector in comparative perspective. The course demonstrates how the events of the past provide important historical context for understanding contemporary philanthropy, encompassing charity, reform, foundations, nonprofit organizations, voluntary associations, and individual actors. **PHST-P690 Quantitative Behavioral Research Methods:** This is a class about research design. The emphasis of the course is on the process of conducting research. You will learn about the art and the science of social inquiry. In many ways, this class provides a how-to manual for

the rest of the degree. Metaphorically, this class is about equipping you with a methodological "toolbox" with tools that can be utilized to design, collect, interpret, and report research results. These tools are sharpest when combined with topic knowledge to identify issues of interest, theoretical capacities to explain social phenomena, and analysis techniques to further interpret and report upon research results (i.e., the content of other courses). At the center of this broader learning process is research design (this course). **PHST-P790 Dissertation Research Seminar:** Students may enroll in P890 once the majority of required coursework is completed and they are preparing for qualifying exams. After completing all coursework, passing qualifying exams, and defending their research proposal, students work independently with their faculty committee to complete their dissertation, a product of original research in philanthropic studies.

Philosophy

School of Liberal Arts

Departmental URL: liberalarts.indianapolis.iu.edu/departments/philosophy

Program URL: liberalarts.indianapolis.iu.edu/departments/philosophy/current-students/graduate/ma-in-philosophy **Departmental email:** crcarmic@iu.edu or teamgrad@iu.edu

Curriculum

Programs offered

Graduate Certificate in American Philosophy, Graduate Certificate in Bioethics, Doctoral Minor in Philosophy, Doctoral Minor in Bioethics

Graduate Certificate Admission Requirements

1. Bachelor's degree and transcripts from all colleges and/or universities attended, with an overall undergraduate GPA of at least 3.0.
2. One letter of recommendation
3. Personal statement
4. International students must submit TOEFL or IELTS scores. Information about TOEFL can be obtained from the International Affairs Office, 902 W. New York Street, ES 2126, Indianapolis, IN 46202 or email oia@iu.edu or call 317- 274-7000.
5. The following deadlines must be observed in order to receive consideration for admission:

March 1 - for fall semester

October 15 - for spring semester

Graduate Certificate in American Philosophy

The Graduate Certificate in American Philosophy gives students the opportunity to study in a one-year program at one of the world's premier places for studying American philosophy and especially the thought of Charles Sanders Peirce. IU Indianapolis is home to the [Institute for American Thought](#), which contains the Peirce Edition Project, the Santayana Edition, the Frederick Douglass Papers, the Ray Bradbury Center, the Josiah Royce Papers, and the Max H. Fisch Library.

In addition to developing a strong grasp of the major figures, theories, and debates that shape American

philosophy, students in this program will learn to interpret and evaluate complex philosophical ideas and sharpen their ability to write and speak clearly about the issues that matter in this area of study.

Course Requirements

To complete the certificate students should take 15 credit hours, of which at least 9 credits must be taken on the IU Indianapolis campus. All courses must be at the 500-level or higher and be completed with a grade B or better. Students for the American Philosophy certificate are required to take PHIL P558. In addition, students should take nine credit hours in concentration-specific courses and three credit hours in an elective course.

Core (3 cr.):

- PHIL-P 558 Classical American Philosophy

Concentration-Specific selected from the following (9 cr.):

- PHIL-P 503 The Semiotics of C. S. Peirce (3 cr.)
- PHIL-P 507 American Philosophy & Analytic Tradition (3 cr.)
- PHIL-P 514 Pragmatism (3 cr.)
- PHIL-P 549 Bioethics and Pragmatism (3 cr.)
- PHIL-P 590 Intensive Reading [when track-specific; repeat for 6 cr. max] (1-4 cr.)
- PHIL-P 600: Topics in Philosophy [when track-specific] (3 cr.)
- PHIL-P 650 Topics in Semiotic Philosophy (3 cr.)
- PHIL-P 701 Peirce Seminar (3 cr.)
- PHIL-P 748 Seminar in American Philosophy (3 cr.)

Elective Course from any of the above courses or any of the following courses (3 cr.):

- PHIL-P 514 Pragmatism (3 cr.)
- PHIL-P 515 Medieval Philosophy (3 cr.)
- PHIL-P 522 Topics in the History of Modern Philosophy (3 cr.)
- PHIL-P 536 Topics Hist of Contemporary Philosophy (3 cr.)
- PHIL-P 540 Contemporary Ethical Theories (3 cr.)
- PHIL-P 543 Contemporary Social and Political Philosophy (3 cr.)
- PHIL-P 553 Philosophy of Science (3 cr.)
- PHIL-P 560 Metaphysics (3 cr.)
- PHIL-P 562 Theory of Knowledge (3 cr.)

Graduate Certificate in Bioethics

The Bioethics Graduate Certificate gives students the chance to spend a year immersed in one of today's fastest-growing and most impactful fields. At IU Indianapolis, students will be right in the middle of one of the country's largest health-profession hubs, with access to the nation's second-largest medical school, the largest multi-purpose School of Nursing, and the [Indiana University Center for Bioethics](#)—a place where interdisciplinary research, real-world problem-solving, and public engagement all come together. It's an ideal

setting for students who want to understand how ethical questions shape medicine, science, policy, and patient care.

This certificate is a great fit for a student already working in a health-related field and want to strengthen their credentials without committing to a full master's program. Nurses often complete the Bioethics Graduate Certificate in order to prepare for roles on hospital ethics committees or institutional review boards. A student might choose to pair the certificate with a professional degree in medicine, nursing, law, or the health sciences, or as a stepping stone toward an M.A. or Ph.D. in philosophy or bioethics. This certificate equips students for roles in policy development, compliance, ethics oversight, education, and legislative work—anywhere thoughtful ethical analysis is essential.

Students completing this certificate build a strong understanding of key thinkers, theories, and debates in bioethics, learn to interpret and evaluate complex arguments, and develop the ability to communicate clearly and confidently about the issues that matter in this field.

Course Requirements

To complete the certificate, students should take 15 credit hours, of which at least 9 credits must be taken on the IU Indianapolis campus. All courses must be at the 500-level or higher and be completed with a grade B or better. Students in the Bioethics certificate program are required to take PHIL P547. In addition, students should take nine credit hours in concentration-specific courses and three credit hours in an elective course.

Core (3 cr.):

- PHIL-P 547 Foundation of Bioethics

Concentration-Specific selected from the following (9 cr.):

- ANTH-E 445 Medical Anthropology (3 cr.)
- COMM-C 510 Health Provider-Con Comm (3 cr.)
- HIST-H 546 History of Medicine (3 cr.)
- LAW-DN 761: Law and Public Health (2 cr.)
- LAW-DN 838 Bioethics and Law (2 cr.)
- LAW-DN 845: Fin and Reg Health Care (3 cr.)
- MHHS-M 504 Introduction to Research Ethics (3 cr.)
- NURS-N 534 Ethical/Legal Persp Adv Nurs Prac (2 cr.)
- PHIL-P 548 Clinical Ethics Practicum (3 cr.)
- PHIL-P 549 Bioethics and Pragmatism (3 cr.)
- PHIL-P 555: Eth/Pol Issues in International Research (3 cr.)
- PHIL-P 600: Topics in Philosophy [when content is track-specific] (3 cr.)
- PHIL-P 696 Topics in Biomedical Ethics (3 cr.)
- SOC-R 515 Sociology of Health and Illness (3 cr.)
- SOC-S 560 Topics: Death and Dying (3 cr.)

Elective Course from any of the above courses or any of the following courses (3 cr.):

- PHIL-P 514 Pragmatism (3 cr.)
- PHIL-P 515 Medieval Philosophy (3 cr.)
- PHIL-P 522 Topics in the History of Modern Philosophy (3 cr.)
- PHIL-P 536 Topics Hist of Contemporary Philosophy (3 cr.)
- PHIL-P 540 Contemporary Ethical Theories (3 cr.)
- PHIL-P 543 Contemporary Social and Political Philosophy (3 cr.)
- PHIL-P 553 Philosophy of Science (3 cr.)
- PHIL-P 558 American Philosophy (3 cr.)
- PHIL-P 560 Metaphysics (3 cr.)
- PHIL-P 562 Theory of Knowledge (3 cr.)

Ph.D. Minor in Philosophy Information

The Philosophy doctoral minor offers students an engaging way to integrate graduate level philosophy into their current field of study, so they can think more critically, ask deeper questions, and approach research from fresh angles. This minor provides a strong foundation while still leaving room to tailor the minor to a student's interests. It's a flexible, energizing way to broaden a student's perspective and strengthen the work they are already doing in their primary field.

Course Requirements

The Ph.D. Minor in Philosophy requires 12 credit hours, including 6 credits of core courses and 6 credits of electives. All courses must be passed with grade B or better.

Required courses to be selected from the following (6 cr.):

- PHIL-P 514 Pragmatism (3 cr.)
- PHIL-P 515 Medieval Philosophy (3 cr.)
- PHIL-P 522 Modern Philosophy (3 cr.)
- PHIL-P 536 Topics in Contemporary Philosophy (3 cr.)
- PHIL-P 540 Contemporary Ethical Theories (3 cr.)
- PHIL-P 543 Social and Political Philosophy (3 cr.)
- PHIL-P 553 Philosophy of Science (3 cr.)
- PHIL-P 558 American Philosophy (3 cr.)
- PHIL-P 560 Metaphysics (3 cr.)
- PHIL-P 562 Theory of Knowledge (3 cr.)

Electives (6 cr.)

- Elective courses from any of the above courses or any other 500-700 level course in Philosophy not already taken to meet the core requirements.

Ph.D. Minor in Bioethics Information

The Ph.D. Minor in Bioethics requires 12 credit hours, including 6 credits of core courses and 6 credits of electives. All courses must be passed with grade B or better.

Course Requirements

Required courses (6 cr.):

- PHIL-P 540 Contemporary Ethical Theories (3 cr.)
- PHIL-P 547 Foundations of Bioethics (3 cr.)
- Concentration- Specific Electives- Choose 2 elective courses from the following (6 cr.):
 - PHIL-P 549 Bioethics and Pragmatism (3 cr.)
 - PHIL-P 555 Ethical/Policy Issues in International Research (3 cr.)
 - PHIL-P 590 Intensive Reading (1 - 4 cr.)
 - PHIL-P 600 Topics in Philosophy [when the content is track specific] (3 cr.)
 - PHIL-P 696 Topics in Biomedical Ethics (3 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **PHIL-P 500 Philosophy Proseminar (3 cr.)** An advanced survey of areas and issues addressed in philosophy to familiarize the post-baccalaureate student with the range and diversity of contemporary philosophical discourse.
- **PHIL-P 503 The Semiotics of C. S. Peirce (3 cr.)** A rigorous initiation to Peirce's logic of sign, including his theory of knowledge, his categorially, his definitions and classification of signs, the three branches of semiotics, with an applied research component.
- **PHIL-P 507 American Philosophy and the Analytic Tradition (3 cr.)** An overview of the development of American philosophy with a special focus on its contribution to and influence on the American analytic tradition. This course discusses the views of such philosophers as C. I. Lewis, Rudolph Carnap, W. V. O. Quine, Donald Davidson, Hillary Putnam, and Susan Haack.
- **PHIL-P 514 Pragmatism (3 cr.)** This course examines what pragmatism stood for in its formative years and what it has become; then, after studying some conflicting views of well-known pragmatists, it considers what pragmatism might become. Part of the course is devoted to the contributions of pragmatism to different areas within philosophy.
- **PHIL-P 515 Medieval Philosophy (3 cr.)** Selected study of key medieval philosophers, including Augustine and/or Aquinas.
- **PHIL-P 520 Philosophy of Language (3 cr.)** In-depth treatment of central issues, problems, theories (both classical and contemporary), such as linguistic reference, vague terms, and contextualism.
- **PHIL-P 522 Topics in the History of Modern Philosophy (3 cr.)** Selected topics from key movements, figures, or controversies in modern (17th/18th century) Western philosophy. May be repeated for credit (twice) when topics vary.
- **PHIL-P 525 Topics in the History of Philosophy (3 cr.)** An advanced study of important themes or major figures in the history of philosophy. May be repeated for credit if topics vary.
- **PHIL-P 536 Topics in Contemporary Philosophy (3 cr.)** A study of one or more contemporary (mainly

- 20th-century) schools of Western philosophy (e.g., analytic philosophy, phenomenology, existentialism) or a selection of influential thinkers related to a specific contemporary topic.
- **PHIL-P 540 Contemporary Ethical Theories (3 cr.)** In-depth treatment of classical and contemporary normative and meta-ethical theories, such as consequentialism, deontology, and non-cognitivism.
 - **PHIL-P 541 Selected Topics in the History of Ethics (3 cr.)** Selected topics in history of ethics - ancient, medieval, or modern.
 - **PHIL-P 542 The Ethics and Values of Philanthropy (3 cr.)** An inquiry into the ethics and values of philanthropy rooted in a general understanding of philanthropy, as voluntary action for the public good, as an ethical ideal. A consideration of philanthropic activity in light of this ideal.
 - **PHIL-P 543 Social and Political Philosophy (3 cr.)** Advanced study of central issues, theories, and topics in social/political philosophy, such as property rights, distributive justice, political liberty, and the limits and foundations of state authority.
 - **PHIL-P 547 Foundations of Bioethics (3 cr.)** A rigorous examination of bioethical theory and practice. Stress is placed on moral and conceptual issues embedded in biomedical research, clinical practice, and social policy relating to the organization and delivery of health care.
 - **PHIL-P 548 Clinical Ethics Practicum (3 cr.)** Application of the methods of philosophical analysis to current ethical issues arising in IU-affiliated hospitals and clinics. The practicum gives students firsthand experience of clinical ethics problems in "real time," showing them both the need for conceptual frameworks and the difficulties associated with them.
 - **PHIL-P 549 Bioethics and Pragmatism (3 cr.)** A survey of recent contributions of American philosophy to bioethics. The course strongly focuses on a growing group of philosophers and ethicists who seek their inspiration in Dewey, James, Peirce, Royce, and Mead, while dealing with contemporary issues in medical ethics.
 - **PHIL-P 549 Bioethics and Pragmatism (3 cr.)** This course contains a critical examination of contemporary philosophers who seek their inspiration in Dewey, James, Peirce, Royce, and Mead, while dealing with current issues in medical ethics.
 - **PHIL-P 553 Philosophy of Science (3 cr.)** A study of theories with regard to the nature, purpose, and limitations of science. Attention is given to the cognitive significance of theories, the scientific method (hypothesis formation, theory construction, and testing), research paradigms, reductionism, and social epistemology.
 - **PHIL-P 554 Practicum**
 - **PHIL-P 555 Ethical and Policy Issues in International Research (3 cr.)** Examines ethical and policy issues in the design and conduct of transnational research involving human participants. Topics discussed include economic and political factors; study design; the role of ethics review committees; individual and group recruitment/informed consent; end of study responsibilities; national and international guidelines.
 - **PHIL-P 558 American Philosophy (3 cr.)** A general overview of the most significant contributions of American philosophers, such as Emerson, Thoreau, Peirce, James, Dewey, Santayana, Mead, Jane Adams, Alain Locke.
 - **PHIL-P 560 Metaphysics (3 cr.)** In-depth treatment of central issues, problems, and theories (both classical and contemporary), such as persistence of identity, freedom and determinism, and nominalism.
 - **PHIL-P 561 Philosophy of Mind (3 cr.)** In-depth treatment of central issues, problems, and theories (both classical and contemporary) in philosophy of mind, such as mental causation, the nature of consciousness and dualism.
 - **PHIL-P 562 Theory of Knowledge (3 cr.)** In-depth treatment of central issues, problems, and theories (both classical and contemporary), such as epistemic warrant, Gettier examples, and foundationalism.
 - **PHIL-P 590 Intensive Reading (1-4 cr.)** A tutorial course involving in-depth consideration of a specific philosophical area or problem or author. May be repeated for credit.
 - **PHIL-P 600 Topics in Philosophy (3 cr.)** A detailed examination of a specific topic in philosophy. May be repeated for credit if topics vary.
 - **PHIL-P 650 Topics in Semiotic Philosophy (3 cr.)** An examination of various historical and theoretical issues arising from the philosophical study of semiosis—the general phenomenon of representation, objectification, signification, and interpretation—through the work of mostly American philosophers from the late nineteenth century to the present, with an emphasis on the impact of Peirce's semiotic philosophy. This course is currently not offered.
 - **PHIL-P 694 Biomedical Ethics (3 cr.)** A rigorous examination of bioethical theory and practice. Stress is placed on moral and conceptual issues imbedded in biomedical research, clinical practice, and social policy relating to the organization and delivery of health care.
 - **PHIL-P 696 Topics in Biomedical Ethics (3 cr.)** Selected topics in bioethics, such as international research ethics; ethical issues in pediatrics; ethical issues in genetics.
 - **PHIL-P 701 Peirce Seminar (3 cr.)** This seminar is devoted to a critical examination of the general structure and development of Peirce's systematic philosophy with a special emphasis on those tensions in the development of his thought that led to modifications in his philosophy, and on the nature and significance of those changes.
 - **PHIL-P 730 Seminar in Contemporary Philosophy (3 cr.)** Selected topics in contemporary philosophy. May be repeated for credit if topics vary. May be repeated for credit.
 - **PHIL-P 748 Seminar in American Philosophy (3 cr.)** Advanced study of a principal philosopher or a set of selected topics in classical American philosophy. May be repeated for credit if topics vary.

See other program Bulletin entries for courses outside of Philosophy.

Physics

School of Science

Department of Physics

Science Building, LD 154, 402 North Blackford Street,
Indianapolis, IN 46202-3273

Phone: (317) 274-6900; fax: (317) 274-2393

Web URL: science.indianapolis.iu.edu/physics

Department Chair: Ricardo S. Decca, Ph.D. **Graduate Program Advisor:** Vivek Amin, Ph.D.

Curriculum

Courses

Degrees Offered

Master of Science (M.S.) in Physics
Doctor of Philosophy (Ph.D.) in Physics
Ph.D. Minor in Biophysics
Ph.D. Minor in Mathematical Physics
Ph.D. Minor in Molecular Physics
Ph.D. Minor in Quantum Science

Admissions Requirements

Students seeking to enroll in the Physics graduate programs should have a baccalaureate degree from an accredited institution and a background in the usual undergraduate courses in physics, mathematics, and other sciences. An average grade point average of 3.00 (B) or higher in physics courses is expected. Graduates from related fields of study in pure and applied sciences or engineering may be accepted on a *probationary basis* until they have completed any necessary undergraduate courses in physics. The Graduate Record Examination (GRE) General Test and GRE Physics subject test are recommended but not required.

Transfer Credit – The Department of Physics will normally accept a maximum of 9 transfer credit hours of graduate courses (grade B or higher) from approved institutions, if they are beyond the requirements of an undergraduate degree.

Application for Admission – Application materials and information can be obtained online (via the Department of Physics website) or by writing to the chair of the Graduate Committee, IU Indianapolis Department of Physics (Science Building, LD 154, 402 N. Blackford Street, Indianapolis, IN 46202-3273; phone (317) 274-6900). While the application is being processed, it is possible to enter IU Indianapolis as a graduate non-degree student. Generally, only 12 credit hours earned under this classification may be counted toward an advanced degree.

Financial Assistance – Physics Ph.D. students may receive financial support. Types of support available include teaching and research assistantships, fellowships, and tuition remission.

Letters of Recommendation – Three letters of recommendation from individuals familiar with the applicant's academic and/or professional performance are required.

Transcripts – One original official transcript from each previously attended university program is required, documenting all degrees earned. If any completed university courses do not appear on transcripts, a list of those courses and titles should also be provided.

GRE – The GRE General Test and physics subject test are *not required* but strongly encouraged. Official score reports should be sent directly by the testing service.

English Proficiency – International student requirements as detailed by the Graduate School.

Physics Placement Test – A placement test will be given to all new students in the week before the start of their first semester to identify any problem areas in physics and mathematics and to help decide a plan of study for each student. A second test may be given in the second semester on a case-by-case basis.

Online Application – Be sure to complete the Supplemental Questions section of the online application by answering questions about your motivation, skills, and interests in physics and physics research. Also indicate the specific area of physics that interests you.

Application Fee – An application fee is required and may be paid by credit or debit card.

Fellowships & Assistantships – Submit your application in a timely manner to be considered for fellowships and assistantships at the department and campus levels. If you have questions about timing, contact physics@iu.edu.

Application Deadlines – *The application deadline to receive full consideration for financial aid is January 15 for the Fall semester and July 15 for the Spring semester.*

Master of Science in Physics (thesis; non-thesis options)

Program Learning Outcomes

- Students demonstrate proficiency in the core areas of physics (Classical Mechanics, Electromagnetism, Thermal Physics, and Quantum Physics), and have knowledge of mathematics sufficient to perform the calculations needed to apply their knowledge (Linear Algebra, Ordinary and Partial Differential Equations, Vector Calculus).
- The most important outcome of the M.S. program is the ability to carry out a research project under the supervision of a faculty member. Research includes written and verbal communication. The written portion is demonstrated in a thesis or report, and the ability to communicate verbally is demonstrated during the first part of the public defense. It is not required but is expected that students will present their research at scientific conferences. *The students' progress towards the M.S. degree is evaluated by their advisors and advisory committee.*

Program Description

The Master of Science in Physics is offered in the Department of Physics. Areas of active research within the Department of Physics include, biological physics, AMO physics, condensed matter physics, and physics education. Interdisciplinary research is common. Strong collaborations exist between our faculty and members of other departments of the School of Science, with the

IU School of Medicine, with the School of Engineering and Technology and with the School of Informatics. You'll work closely with an advisor and an advisory committee consisting of your advisor and two other faculty members. You'll work with the faculty to develop a plan of study, and the courses you take will reflect a coherent theme of interest. Students have the option to complete a thesis. In the thesis option, you will complete a research project and write a formal thesis under the supervision of a faculty advisor. Non-thesis students complete a research project under the supervision of a faculty advisor and write a project report.

Degree Requirements

The general requirements for the M.S. program include admission to regular graduate status; completion of the English requirement; passing the core Physics classes (PHYS-I 510, PHYS-I 517, PHYS-I 530, and PHYS-I 550 or equivalent) with a minimum 3.00 grade point average (GPA) satisfactory completion of an approved plan of study; and 30 credit hours of graduate coursework (as outlined below). The English requirement must be satisfied before the plan of study may be filed (see below).

Placement Test – A placement test will be given to all new M.S. students before the start of their first semester to identify problem areas in physics and mathematics and to help decide on a plan of study. A second test may be given in the second semester on a case-by-case basis.

Plan of Study – Each student's plan of study is worked out in cooperation with the student's graduate advisor and committee. It must be submitted and accepted by the Graduate School no later than the semester before the one in which the student plans to graduate.

Grade Requirements – Acceptable grades are A, B, or C (though individual courses or tracks may require higher than a C). Pass/Fail grades are not acceptable. A minimum GPA of 3.00 on the plan of study is required. The M.S. degree requires 30 credit hours of graduate coursework at the 500- and 600-level. At least 24 credit hours must be in Physics and Biophysics. The thesis option requires a written thesis, while the non-thesis option requires a written report. Course requirements are as follows:

Non-thesis Track

- Core Courses (18 credits)
 - PHYS-I 510 Physical Mechanics
 - PHYS-I 517 Statistical Physics
 - PHYS-I 522 Coherent Optics and Quantum Electronics
 - PHYS-I 530 Electricity and Magnetism
 - PHYS-I 545 Solid State Physics
 - PHYS-I 550 Introduction to Quantum Mechanics
 - PHYS-I 570 - Selected Topics - Any topic acceptable
 - PHYS-I 585 Molecular Biophysics
 - PHYS-I 617 Statistical Mechanics
 - PHYS-I 630 Advanced Theory of Electricity and Magnetism
 - PHYS-I 660 Quantum Mechanics I
 - PHYS-I 661 Quantum Mechanics II

- Mathematics Courses (6 credits)
 - Any 500-600 level Math-I course
 - PHYS-I 600 METHODS OF THEORETICAL PHYSICS I
- Research (6 credits)
 - PHYS-I 590 READING & RESEARCH

Thesis Track

- Core Courses (18 credits)
 - PHYS-I 510 Physical Mechanics
 - PHYS-I 517 Statistical Physics
 - PHYS-I 522 Coherent Optics and Quantum Electronics
 - PHYS-I 530 Electricity and Magnetism
 - PHYS-I 545 Solid State Physics
 - PHYS-I 550 Introduction to Quantum Mechanics
 - PHYS-I 570 - Selected Topics - Any topic acceptable
 - PHYS-I 585 Molecular Biophysics
 - PHYS-I 617 Statistical Mechanics
 - PHYS-I 630 Advanced Theory of Electricity and Magnetism
 - PHYS-I 660 Quantum Mechanics I
 - PHYS-I 661 Quantum Mechanics II
- Mathematics Courses (6 credits)
 - Any 500-600 level Math-I course
 - PHYS-I 600 METHODS OF THEORETICAL PHYSICS I
- Research (6 credits)
 - PHYS-I 698 RESEARCH

Doctor of Philosophy in Physics (Ph.D.)

Program Learning Outcomes

- Students demonstrate expertise in core areas of physics (Electromagnetism, Thermal Physics, and Quantum Physics), as well as in other areas associated specifically with their research and the area of their selected minor.
- They demonstrate proficiency in widely used areas of mathematics (Linear Algebra, Ordinary and Partial Differential Equations, Vector Calculus) and in the use of advanced mathematical tools needed in their physics courses and research.
- A key outcome of the Ph.D. program is the ability to perform substantial independent research in collaboration with a faculty member. The research culminates in an original project, written as a thesis and defended in an examination with a public component and an examination by the faculty committee. It is also expected that the student's research findings are published in scientific journals.
- Communication skills are emphasized throughout the Ph.D. program. Students write reports as part of their graduate courses and must demonstrate English proficiency as teaching assistants in recitations and instructional laboratories. In addition, Ph.D. students are required to present their research results at scientific conferences (oral or poster presentations). By the end of the program, the Ph.D. thesis and its defense demonstrate the student's

ability to communicate research results effectively in both spoken and written form.

- The ability of Ph.D. students to plan and design a research project is evaluated at a preliminary examination, after which, if successful, they are fully admitted into the Ph.D. program.

Course Requirements

Core Courses (12 credits): Fulfill all of the following requirements. Take at least 12 credits in total. Other pre-approved courses may also count.

- PHYS-I 617 Statistical Mechanics
- PHYS-I 630 Advanced Theory of Electricity and Magnetism
- PHYS-I 660 Quantum Mechanics I
- PHYS-I 661 Quantum Mechanics II

Elective Courses (3 credits): Fulfill any of the following requirements. Take at least 3 credits in total.

- BIOL-I 507 Principle of Molecular Biology
- BIOL-I 564 Molecular Genetics Development
- CHEM-I 542 Inorganic Chemistry
- PHYS-I 522 Coherent Optics and Quantum Electronics
- PHYS-I 545 Solid State Physics
- PHYS-I 585 Molecular Biophysics
- PSY-I 600 Statistical Inference
- PSY-I 601 Experimental Design

Dissertation/research (at least 33 credits) Fulfill all of the following requirements. Take at least 33 credits in total.

- PHYS-I 699

Degree Requirements – The general requirements for the Ph.D. program include admission to regular graduate status; completion of the English requirement; passing the qualifying examination; satisfactory completion of an approved plan of study; passing a preliminary exam; and 90 credit hours of graduate coursework. Four core courses must be completed (PHYS-I 617 Statistical Mechanics; PHYS-I 630 Advanced Theory of Electricity and Magnetism; PHYS-I 660 Quantum Mechanics I; PHYS-I 661 Quantum Mechanics II). The student must take three additional specialty courses approved by the Graduate Committee, generally relevant to the student's research interest. All Ph.D. candidates are required to obtain a Ph.D. minor (see below) and must also satisfy the English requirement (see above).

Preliminary Examination – The preliminary exam is a certification exam in which the student presents a plan of proposed research to their advisory committee. The exam is defended in front of the committee. Beyond the preliminary exam, students are required to present annual progress reports to their advisory committee.

Minor Requirement – All Ph.D. students in Physics must earn a related minor in a sub-discipline different from the main area of research. Available minor options include Biophysics, Mathematical Physics, Molecular Physics, or Quantum Science.

Physics Minors in the School of Science Biophysics

Required course:

- PHYS 523 Nanosystems Principles

Elective or substitute courses:

- PHYS 585 Introduction to Molecular Biophysics
- CHEM 533 Introductory Biochemistry
- CHEM 575 Intermediate Physical Chemistry

Mathematical Physics

Required course:

- PHYS 600 Methods of Theoretical Physics

Elective or substitute courses:

- MATH 514 Numerical Analysis
- MATH 520 Boundary Value Problems of Differential Equations
- MATH 522 Qualitative Theory of Differential Equations
- MATH 523 Introduction to Partial Differential Equations

Molecular Physics

Required courses:

- PHYS 517 Statistical Physics
- PHYS 545 Solid-State Physics

Elective or substitute courses:

- PHYS 523 Nanosystems Principles
- PHYS 617 Statistical Mechanics
- PHYS 585 Introduction to Molecular Biophysics

Quantum Science

Required course:

- PHYS 522 Coherent Optics and Quantum Electronics

Elective or substitute courses:

- PHYS 517 Statistical Physics
- PHYS 523 Nanosystems Principles
- PHYS 617 Statistical Mechanics
- PHYS 660 Quantum Mechanics I
- PHYS 661 Quantum Mechanics II

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

PHYS-I 510 Physical Mechanics (3 cr): Mechanics of particles, rigid bodies, and vibrating systems.

PHYS-I 517 Statistical Physics (3 cr): Law of thermodynamics; Boltzmann and quantum statistical distributions, with applications to properties of gases, specific heats of solids, paramagnetism, black-body radiation, and Bose-Einstein condensation; Boltzmann

transport equation and transport properties of gases; Brownian motion and fluctuation phenomena.

PHYS-I 522 Coherent Optics and Quantum Electronics (3 cr): Recent experimental and theoretical developments in optics emphasizing concepts of coherence. Fourier optics, and the quantum theory of radiation. Applications to lasers and masers, nonlinear optics, holography, and quantum electronics.

PHYS 523 Nanosystems Principles (3 cr): This is the introductory course in the nanosystems area. It introduces students to the principles and applications of nanosystems. The course begins with an introduction to the nanometer scale phenomena. It then introduces students to the basic elements resulting in nanosystems: nanoscale materials, processes, and devices. It also provides students with a basic understanding of the tools and approaches that are used for the measurement and characterization of nanosystems, and their modeling and simulation. Moreover, the course covers the applications of nanosystems in a wide range of industries, including information technology, energy, medicine, and consumer goods. The course concludes with a discussion of the societal and economical significance of these applications, including benefits and potential risks.

PHYS-I 530 Electricity and Magnetism (3 cr): Electrostatic problems; theory of dielectrics; theory of electric conduction; electromagnetic effects due to steady and changing currents; magnetic properties of matter; Maxwell's equations; electromagnetic radiation.

PHYS-I 545 Solid State Physics (3 cr): Crystal structure; lattice vibrations and electronic band structure of crystals; electrical, optical, and thermal properties of solids; transport and other nonequilibrium phenomena in uniform and nonuniform materials.

PHYS-I 550 Introduction to Quantum Mechanics (3 cr): Brief historical survey of the development of quantum mechanics, wave-packets, uncertainty principle, wave functions, operators, Schrödinger equation with application to one-dimensional problems, the hydrogen atom, electron spin, selected topics in perturbation theory, scattering theory, and compounding of angular momenta.

PHYS-I 570 Selected Topics (3 cr): Specialized topics in physics selected from time to time.

PHYS-I 585 Molecular Biophysics (3 cr): Application of concepts and methods from physics to the understanding of biological systems with a focus on proteins, lipids and nucleic acids. Introduction of experimental and theoretical techniques, including X-ray crystallography, nuclear magnetic resonance and molecular dynamics simulations in the investigation of structures, forces, dynamics and energetics of these biological molecules.

PHYS-I 590 Reading & Research (1-6 cr): Reading and research in Physics.

PHYS-I 600 Methods of Theoretical Physics I (3 cr): Designed to provide first-year physics graduate students with the mathematical background for subsequent studies of advanced mechanics, electrodynamics, and quantum theory. Topics treated include functions of a complex variable, ordinary and partial differential equations, eigenvalue problems and orthogonal functions. Green's

functions, matrix theory, and tensor analysis in three and four dimensions.

PHYS-I 617 Statistical Mechanics (3 cr): Classical and quantum statistical mechanics.

PHYS-I 630 Advanced Theory of Electricity and Magnetism (3 cr): The experimental origins of Maxwell's equations. Electrostatics and magnetostatics; solution of boundary value problems. Quasi-static currents. Electromagnetic energy and momentum and the Maxwell stress tensor. Foundations of optics. Radiation from antennas, multi-pole expansion; waveguides.

PHYS-I 660 Quantum Mechanics I (3 cr): Origins of the quantum theory, the uncertainty and complementarity principles. The Schrodinger equation and its solutions for simple physical systems. Mathematical formulation of the quantum theory. Applications: simple harmonic oscillator, theory of angular momentum, the hydrogen atom. Time-independent and time-dependent perturbation theory. The Pauli exclusion principle. Spin of the electron. Elementary theory of scattering.

PHYS-I 661 Quantum Mechanics II (3 cr): Symmetry and conservation laws. The Klein-Gordon and Dirac equations. Interaction of radiation with matter. Applications of quantum mechanics to atomic structure. Scattering theory.

PHYS-I 698 RESEARCH (1-15 cr): M.S. thesis.

PHYS-I 699 RESEARCH (1-18 cr): Ph.D. thesis.

PSY-I 600 Statistical Inference (3 cr): Emphasis is given to principles underlying both parametric and nonparametric inference.

PSY-I 601 Experimental Design (3 cr): Continuation of PSY-I 600 with emphasis upon the design and analysis of experiments.

CHEM 533 Introductory Biochemistry (3 cr): A rigorous one-semester introduction to biochemistry.

CHEM-I 542 Inorganic Chemistry (3 cr): A survey of the chemistry of main group and transition elements in which descriptive chemistry is wedded to qualitative theories of bonding and structure.

CHEM 575 Intermediate Physical Chemistry (3 cr): Quantum theory of atoms and molecules; theories of chemical bonding; molecular spectroscopy, methods for determining molecular structure; electrical and magnetic properties.

MATH 514 Numerical Analysis (3 cr): Numerical analysis is concerned with finding numerical solutions to problems, especially those for which analytical solutions do not exist or are not readily obtainable. This course provides an introduction to the subject and treats the topics of approximating functions by polynomials, solving linear systems of equations, and of solving nonlinear equations. These topics are of great practical importance in science, engineering and finance, and also have intrinsic mathematical interest. The course concentrates on theoretical analysis and on the development of practical algorithms.

MATH 520 Boundary Value Problems of Differential Equations (3 cr): Separation of variables; Fourier series;

boundary value problems; Fourier transforms; Bessel functions; Legendre polynomials.

MATH 522 Qualitative Theory of Differential Equations (3 cr): Linear systems; nonlinear conservative and nonconservative systems; classification of critical points; self-oscillating systems, cycles, relaxation oscillations; stability.

MATH 523 Introduction to Partial Differential Equations (3 cr): First order quasi-linear equations and their application to physical and social sciences; the Cauchy-Kovalevsky theorem; characteristics, classification, and canonical form of linear equations; equations of mathematical physics; study of the Laplace, wave and heat equations; methods of solution.

BIOL-I 507 Principle of Molecular Biology (3 cr): Molecular aspects of structure and function of nucleic acids and proteins, including recombinant DNA research. Prokaryotic and eukaryotic molecular biology are given equal weight.

BIOL-I 564 Molecular Genetics Development (3 cr): The course examines the genetic and developmental bases as well as phenotypes of 40 genetic disorders. Chromosomal, single gene, complex and developmental genetic disorders are studied in detail. Emphasis is placed on molecular techniques and understanding current primary literature.

Population Health Analytics

Richard M. Fairbanks School of Public Health

Program email: fsphinfo@iu.edu

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctoral/minors/population-health-analytics

Doctoral Minor in Population Health Analytics

The IU Richard M. Fairbanks School of Public Health offers a PhD minor in Population Health Analytics that prepares doctoral students to analyze patterns and trends in large data sets in the context of population health (e.g., health services research, public health).

Students will learn both the theories and methods needed to be successful in the conduct of research across the health data sciences. Skills and methods taught in this minor are highly sought by employers - including governmental research agencies as well as academic programs across the spectrum of higher education.

While graduate students can take a single course on data science within their department to grasp the main concepts, one course is not sufficient to develop a core competency in applying a broad range of analytic techniques to population health data sets.

By combining a diverse set of related courses from multiple schools and departments, we offer a unique minor that adds value to the individual courses emerging across campus. When complete, students will be prepared for success in the population health sciences.

This minor is open to any doctoral student at IU Indianapolis and not just those in the Fairbanks School of Public Health. Students who wish to obtain a doctoral

minor from the IU Richard M. Fairbanks School of Public Health must earn a grade of "B" or better in the coursework for the minor. Courses in which a grade of "B-" or lower is earned will not apply toward completion of the minor. Faculty in the departments of epidemiology and health policy & management will serve as minor advisors for students pursuing this doctoral minor.

Curriculum

Required Courses

- PBHL-E 647 Introduction to Population Health Analytics (3 credits)

Choose two courses from the following list:

- INFO-B 573 Programming for Life Sciences (3 credits)
- INFO-B 585 Biomedical Analytics (3 credits)
- INFO-B 643 Natural Language Processing for Biomedical Records and Reports (3 credits)
- INFO-H 515 Introduction to Data Analytics (3 credits)
- INFO-H 516 Applied Cloud Computing for Data Intensive Sciences (3 credits)
- INFO-H 517 Visualization Design, Analysis, and Evaluation (3 credits)

Choose one course from the following list:

- PBHL-H 628 Health Information Systems (3 credits)
- PBHL-E 645 Information Exchange for Population Health (3 credits)

Courses

- **PBHL-E 645 Information Exchange for Population Health (3 credits):** This course explores the electronic exchange of data, information and knowledge between clinical and public health organizations in support of population health. Students will examine the strategic, organizational, legal, technical, and socio-political aspects of clinical and public health information exchange in the United States and abroad.
- **PBHL-E 647 Introduction to Population Health Analytics (3 credits):** This course examines the use of analytics and big data in the context of population health within governmental public health agencies as well as health systems. Students will be introduced to a host of methods used to analyze population health data, and gain technical skills required to perform analytics in support of real world use cases.
- **PBHL-H 628 Health Information Systems (3 credits):** This course provides an introduction to the management of health information systems. Topics include analyzing system requirements, system design and evaluation, selecting computer resources, and managing the implementation process.
- **INFO-B 573 Programming for Life Sciences (3 credits):** Students will receive a thorough understanding of software development for chem- and bioinformatics, and broaden experience of working in a scientific computing group. Topics include programming for the web, depiction of chemical and biological structures in 2D and 3D, science informatics tool kits, software APIS, AI and machine-learning algorithm development, high

performance computing, database management, managing a small software development group, and design and usability of science informatics software.

- **INFO-B 585 Biomedical Analytics (3 credits):** This introductory course is designed for graduate students and is intended to build their understanding of using patient data, genomic databases, and electronic health records (EHR) to improve patient care and to achieve greater efficiencies in public and private healthcare systems. The course explores the concept of clinical intelligence and the role of analytics in supporting a data-driven learning healthcare system. Key topics include the value-driven healthcare system, measuring health system performance, existing quality/performance measurement frameworks (NQF, HEDIS), comparing healthcare delivery, attributes of high performing healthcare systems, and the IT infrastructure and human capital needed to leverage analytics for health improvement.
- **INFO-B 643 Natural Language Processing for Biomedical Records and Reports (3 credits):** This course familiarizes students with applications of Natural Language Processing and text mining in health care. While the course provides a short introduction to commonly used algorithm, techniques and software, the focus is on existing health care applications including clinical records and narratives, biomedical literature and claims processing.
- **INFO-H 515 Introduction to Data Analytics (3 credits):** This course applies statistical learning methods for data mining and inferential and predictive analytics to informatics-related fields. The course also covers techniques for exploring and visualizing data, assessing model accuracy, and weighing the merits of different methods for a given real-world application. This course is an essential toolset for transforming large, complex informatics datasets into actionable knowledge.
- **INFO-H 516 Applied Cloud Computing for Data Intensive Sciences (3 credits):** This course covers data science concepts, techniques, and tools to support big data analytics, including cloud computing, parallel algorithms, nonrelational databases, and high-level language support. The course applies the MapReduce programming model and virtual-machine utility computing environments to data-driven discovery and scalable data processing for scientific applications.
- **INFO-H 517 Visualization Design, Analysis, and Evaluation (3 credits):** This is an introductory course in design and evaluation of interactive visualizations for data analysis. Topics include human visual perception, visualization design, interaction techniques, and evaluation methods. Students develop projects to create their own web-based visualizations and develop competence to undertake independent research in visualization and visual analytics.

Population Health Science

Richard M. Fairbanks School of Public Health

School email: fsphinfo@iu.edu

Curriculum

Courses

Degree Offered

Doctor of Philosophy (Ph.D.) in Population Health Science

Doctor of Philosophy (Ph.D.) in Population Health Science

The Population Health Science Ph.D. is an interdisciplinary research program jointly administered by the Department of Epidemiology and Department of Health Policy and Management. Students will develop the analytical, methodological, and professional research skills needed to pursue academic, industry, non-profit, and governmental careers that tackle population health challenges facing Indiana, our nation, and the world. After completing interdisciplinary core courses, students will concentrate in either Epidemiology or Health Policy and Management to deepen their knowledge and skills in either sub-discipline.

Students completing the Ph.D. will be able to:

1. Design and conduct research studies including epidemiologic investigations or program/policy evaluation.
2. Manage and utilize administrative sources, surveillance systems and other secondary data sources in research studies.
3. Demonstrate and apply knowledge of public and population health, including the US health care systems and epidemiological principles to guide research.
4. Conduct advanced quantitative and qualitative data analysis, utilize and report the results.
5. Effectively interpret and communicate findings of original research for scholarly audiences.
6. Translate and apply findings from original and existing research.
7. Prepare proposals for peer-reviewed research funding and manage research projects.

Epidemiology Track Competencies

The Epidemiology track focuses on the following core competencies that serve as a measure of growth and criteria for assessment.

1. Design investigations of acute and chronic conditions, as well as other adverse health outcomes in targeted populations characterized by age, sex, race, ethnicity, culture, societal, educational, and other demographic backgrounds.
2. Manage and analyze data from epidemiologic investigations and surveillance systems.
3. Use current knowledge of causes of disease to guide epidemiologic perspectives.
4. Prepare written reports and presentations to effectively communicate epidemiological evidence to professional audiences.
5. Prepare proposals for peer-reviewed funding.

Health Policy and Management Track Competencies

The Health Policy and Management track focuses on the following core competencies that serve as a measure of growth and criteria for assessment.

1. Design and conduct health policy and services research studies.
2. Manage and utilize administrative sources, surveillance systems and other secondary data sources in research studies.
3. Demonstrate and apply knowledge of public and population health, including the US health care systems and epidemiological principles to guide research.
4. Conduct advanced quantitative and qualitative data analysis, utilize and report the results.
5. Effectively interpret and communicate findings of original research for scholarly audiences
6. Translate and apply findings from original and existing research.
7. Prepare proposals for peer-reviewed research funding and manage research projects.

Admission Requirements

- All applications must be completed through the SOPHAS, the centralized application service for public health, at which time applicants will indicate their concentration of choice.
- Transcripts from all U.S. institutions attended are required (must be sent directly from the institutions to SOPHAS). This includes previous study at Indiana University. It is strongly recommended that all transcripts be submitted at least two weeks in advance of the deadline to allow SOPHAS adequate time to verify transcripts. Please note that it can take up to four weeks for transcripts to be verified.
- All applicants with foreign academic credentials must provide a World Education Services (WES) ICAP course-by-course evaluation of those credentials. Applicants should submit their transcripts to WES at least one month in advance of the application deadline to ensure that the evaluation is completed in time.
- Students should have a cumulative Grade point average (GPA) of 3.0 or higher on all post-secondary coursework.

Graduate Record Examination (GRE)

GRE scores are not required for admission, however, if you plan to attend the PhD program as a full-time funded student, you are strongly encouraged to submit them with your application, since some funding sources require current GRE scores (less than five years old) in order for students to be eligible. Applicants must submit GRE scores to SOPHAS using the following designation DI Code: 0167.

- Provide an essay of approximately 750 words describing your education, experience, and career objectives. Comment on: how you plan to use a research-oriented doctoral degree in the future, current needs and/or challenges you perceive as important to population health science, and your personal qualities, characteristics, and skills that will enable you to be successful in your doctoral studies and beyond.
- A résumé or CV, in which educational background and each position listed provides the job title, employing agency, dates employed, and responsibilities held. Indicate relevant strengths,

skills, or experiences, such as research knowledge or experience, teaching experience, or other relevant to population health, epidemiology, or health policy and management. Include professional certifications, honors, and awards.

- Three letters of recommendation are required from persons qualified to assess your academic work; relevant practice or professional experiences, or research potential in population health, epidemiology, or health policy and management. These letters should be from professional sources that can provide an unbiased, current and critical assessment of your abilities, skills, strengths, and weaknesses related to successfully completing a research-oriented doctoral program.
- Applicants whose native language is not English or whose academic study was done exclusively at non-English speaking institutions, must demonstrate English proficiency by providing either official Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores. Scores must be less than two years old. TOEFL scores may be submitted to SOPHAS using the designation DI Code 5688; IELTS scores can be uploaded electronically to SOPHAS and official copy sent to IU Indianapolis School Code 1325. The English Language test requirement may be waived if an applicant has earned a bachelor's degree or higher from the U.S. or other English-speaking country. The preferred minimum English language test scores for admission are:
 - Internet-based TOEFL: minimum score of 92
 - IELTS (total band score): minimum score of 7
 - Applicants will be required to complete an interview. The applicants are invited to interview at the discretion of the admission committee.

Course Requirements

The Ph.D. in Population Health Sciences requires 69 credits of didactic coursework and 21 credits of directed research for 90 credits total. The degree is designed to be completed in 4 years of full-time study. Some students may be able to transfer coursework from previous graduate studies.

Core Courses (39 credits)

Public and Population Health Foundations (4 courses, 12 credits)

- PBHL-P 504 U.S. Healthcare System and Health Policy (3 credits)
- PBHL-P 517 Fundamentals of Epidemiology (3 credits)
- PBHL-H 531 Population Health and Value-based Care (3 credits)
- PBHL-E 601 Advanced Epidemiology (3 credits)

Public and Population Health Research Methods Core (9 courses, 27 credits)

- PBHL-E 606 Grant Writing for Public Health (3 credits)
- PBHL-B 552 Fundamentals of Data Management (using SAS or R) (3 credits)

- PBHL-H 781 Research Design in Health Policy and Management Research (3 credits)
- PBHL-B 571 Biostatistics Method I: Linear Model in Public Health (3 credits)
- PBHL-E 635 Foundations of Public Health Informatics (3 credits)
- PBHL-E 647 Introduction to Population Health Analytics (3 credits)
- PBHL H783 Qualitative Methods (3 credits)
- PBHL P747 Population Health Science Research Seminar (fall) (3 credits)
- PBHL P747 Population Health Science Research Seminar (spring) (3 credits)

Concentration Courses (18 credits)

Students select one concentration of: epidemiology or health policy and management.

Epidemiology Concentration Electives (choose 6 courses, 18 credits)

- MGEN-G 788/INFO-I 590 Intro to the Next Generation Sequencing Technology (3 credits)
- INFO-B 636 Next Generation Genomic Data Analysis (3 credits)
- PBHL-B 581 Introduction to Computing (using R) (3 credits)
- PBHL-E 618 Global Cancer Epidemiology (3 credits)
- PBHL-B 573 Biostatistics Method III: Applied Survival Data Analysis (3 credits)
- PBHL-B 574 Biostatistics Method IV: Applied Longitudinal Data Analysis (3 credits)
- PBHL-B 582 Introduction to Clinical Trials (3 credits)
- PBHL-E 715 Design and Implementation of Observational Studies (3 credits)
- PBHL-E 645 Information Exchange for Population Health (3 credits)
- PBHL-H 657 Applications of Cost-Effectiveness Analysis in Public Health (3 credits)

Health Policy and Management Concentration Electives (choose 6 courses, 18 credits)

- PBHL-H 514 Health Economics (3 credits)
- PBHL-H 628 Healthcare Information Systems (3 credits)
- PBHL-H 747 Health Policy and Management Research Seminar II (fall) (3 credits)
- PBHL-B 573 Biostatistics Method III: Applied Survival Data Analysis (3 credits)
- PBHL-B 574 Biostatistics Method IV: Applied Longitudinal Data Analysis (3 credits)
- PBHL-B 582 Introduction to Clinical Trials (3 credits)
- PBHL-E 715 Design and Implementation of Observational Studies (3 credits)
- PBHL-E 645 Information Exchange for Population Health (3 credits)
- PBHL-H 657 Applications of Cost-Effectiveness Analysis in Public Health (3 credits)

Minor (12 credits)

Students must complete a PhD minor. The minor must contain at least four graduate courses (12 credit hours) and comply with the requirements of the minor department/unit. Students wishing to complete a minor

outside of the following should consult with the program director for guidance.

Directed Research (21 credits)

- PBHL-E 799 or PBHL-H 799 Dissertation Proposal (4 credits)
- PBHL-E 800 or PBHL-H 800 Doctoral Dissertation Research (17 credits)

Grade Requirements

In order to be in good academic standing, the Ph.D. program requires students maintain a minimum 3.0 cumulative GPA. A grade of B or better must be earned. For courses to meet graduation requirements, a grade of B or better must be earned. Courses where a grade of B- or lower has been earned must be retaken for the student to meet graduation requirements. If the course is an elective, that specific course does not have to be repeated, but an alternate must be chosen, and a grade of B must be achieved in order to meet the program of study requirements.

Program Requirements

The written qualifying examination is designed to assess the student's attainment of the Population Health Science Ph.D. learning objectives and is taken after the coursework for the PhD has been completed. Students who fail the qualifying examination are normally allowed to retake it once.

Students who have passed the qualifying examination must enroll each semester (excluding summer sessions) for dissertation credits. Once such students have accumulated 90 credit hours in completed coursework and dissertation credits, they must enroll for six hours of graduate credit (GRAD-G901) each semester until the degree is completed. The fee for this course is \$150. Students are permitted to enroll in G901 for a maximum of six semesters.

Academic Progress

Students must maintain adequate progress toward degree completion. After passing the qualifying exam, they must continue advancing to meet the seven-year degree completion deadline.

Dissertation

The dissertation will be written on an original topic of research and presented as one of the final requirements for the Population Health Science Ph.D. degree. The student's dissertation research committee will be comprised of members of the graduate faculty. The chair of the dissertation research committee must be a regular faculty member in the Department of Epidemiology or the Department of Health Policy and Management, and a full member of the graduate faculty.

The student will submit to the IU Indianapolis Graduate Office, acting for the University Graduate School Indianapolis, a two-page prospectus of the dissertation research and the membership of the research committee at least six months before the defense of the dissertation for their approval.

After the committee has reviewed the dissertation, the student will defend the dissertation orally in a public forum

before the committee. Following the dissertation defense, all deficiencies must be adequately addressed to obtain approval by the dissertation research committee.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Courses

- **PBHL-B 552 Fundamentals of Data Management (using SAS or R): (3 credits):** This course teaches concepts related to research data planning, collection, storage, processing, and dissemination. The curriculum includes theoretical guidelines and practical tools for conducting public health research. Hands-on training with real-world examples and problem-solving exercises in SAS will be used to ensure that students are comfortable with all concepts.
- **PBHL-B 571 Biostatistics Method I: Linear Model in Public Health (3 credits):** This course introduces statistical modeling techniques for continuous and categorical outcome data. Topics include ANOVA, Analysis of Covariance, and linear regression, with an emphasis on health sciences applications. Instruction integrates theoretical foundations with hands-on data analysis using SAS and R, enabling students to apply practical methods to biomedical research problems.
- **PBHL-B 573 Biostatistics Method III: Applied Survival Data Analysis (3 credits):** This course covers the basic concepts of survival analysis, Kaplan-Meier curves, logrank test, Cox proportional hazard model, parametric survival models, and certain extensions. Expectations upon completion: for survival data, you should know which method to use, how to implement in software and how to interpret the results.
- **PBHL-B 574 Biostatistics Method IV: Applied Longitudinal Data Analysis (3 credits):** This course covers modern methods for the analysis of repeated measures, correlated outcomes and longitudinal data, including the unbalanced and incomplete data frequently encountered in biomedical research. Class presentations and homework assignments will focus on data analysis in SAS using PROC GLM, PROC MIXED, PROC GENMOD, and PROC NLMIXED.
- **PBHL-B 581 Introduction to Computing (using R) (3 credits):** This is a course teaching fundamental concepts of biostatistical computing, a broad set of skills required for data acquisition, processing and visualization. This course is oriented in programming in R, uses non-standard evaluation (NSE) techniques within the R language, and creates reproducible software in package form for the R language.
- **PBHL-B 582 Introduction to Clinical Trials (3 credits):** This is a standard course that prepares Biostatisticians for support of clinical trial projects. The course will cover fundamental aspects of the appropriate design and conduct of medical experiments involving human subjects (clinical research/trials) including ethics, design, sample size calculation, randomization, monitoring, data collection, analysis and reporting of the results.
- **PBHL-E 601 Advanced Epidemiology (3 credits):** The course focuses on Environmental Health which is the branch of public health that protects against the effects of environmental hazards that can adversely affect health or the ecological balances essential to human health and environmental quality. The environment influences many aspects of human health and well-being. Many diseases are initiated, promoted, sustained, or stimulated by environmental factors. For these reasons, the interactions people have with their environment are an important component of public health.
- **PBHL-E 606 Grant Writing for Public Health (3 credits):** The course is open to all graduate students. The course will introduce the grant writing format and process and teach some grantsmanship. Student will have an opportunity to exercise the grant writing process.
- **PBHL-E 618 Global Cancer Epidemiology (3 credits):** This course is designed to provide an overview of the epidemiology of common cancers, as well as methodologic issues in etiologic research and cancer screening. Emphasis will be placed on risk factors that can be modified for cancer control and prevention.
- **PBHL-E 635 Foundations of Public Health Informatics (3 credits):** This course will introduce the application of Informatics in the Public Health field. The course will include a brief review of core public health functions, describe the current policies defining the use of informatics in public health, and outline the history of the application of informatics principles in both public health and clinical health systems.
- **PBHL-E 645 Information Exchange for Population Health (3 credits):** This course explores the electronic exchange of data, information and knowledge between clinical and public health organizations in support of population health. Students will examine the strategic, organizational, legal, technical, and socio-political aspects of clinical and public health information exchange in the United States and abroad.
- **PBHL-E 647 Introduction to Population Health Analytics (3 credits):** This course examines the use of analytics and big data in the context of population health within governmental public health agencies as well as health systems. Students will be introduced to a host of methods used to analyze population health data, and gain technical skills required to perform analytics in support of real world use cases.
- **PBHL-E 715 Design and Implementation of Observational Studies (3 credits):** This course examines fundamental aspects of designing and implementing observational epidemiology studies. The focus is on developing strategies to increase the validity of the study results by using techniques to control for possible confounding factors and biases. Topics include sampling methods, sensitivity, data weighting, standardization, selection of cases and controls, matching, data collection and project management.

- **PBHL-E 799 Dissertation Proposal (4 credits):** This course will provide students with time to prepare for the qualifying examination and prepare their dissertation prospectus. The prospectus includes the information required by the IU Indianapolis Graduate School.
- **PBHL-E 800 Doctoral Dissertation Research (17 credits):** The dissertation will be written on an original topic of epidemiology research and presented as one of the final requirements for the PhD degree. The dissertation must be an original contribution to knowledge and of high scholarly merit. The candidate's research must reveal critical ability and powers of imagination and synthesis.
- **PBHL-H 514 Health Economics (3 credits):** Examines the principles and applications of economic analysis in the health field and the economist's approach to health care issues. Provides insights offered by economic analysis of specific health issues and problems.
- **PBHL-H 531 Population Health and Value-based Care (3 credits):** This course familiarizes students with the rationale, context, and underlying evidence surrounding US health care reimbursement models including managed care, prospective payment, and value-based purchasing. The population health management framework is then presented as a unifying framework to guide health administrators towards success given new reimbursement models.
- **PBHL-H 628 Healthcare Information Systems (3 credits):** This course provides an introduction to the management of health information systems. Topics include analyzing system requirements, system design and evaluation, selecting computer resources, and managing the implementation process.
- **PBHL-H 657 Applications of Cost-Effectiveness Analysis in Public Health (3 credits):** Cost-effectiveness analysis is widely used in evaluating the performance of public health programs and policies. In this course, students will learn to frame the conceptual model, to collect and synthesize data regarding "cost" and "effectiveness," to perform a "cost-effectiveness" to perform a cost-effectiveness analysis, and to form recommendations based on the analysis.
- **PBHL-H 747 Health Policy and Management Research Seminar II (fall) (3 credits):** This course is designed to be taken repeatedly. Students at different stages of their PhD studies will continue to develop their skills. Taught seminar style, class sessions will often consist of roundtable discussions of published and proposed research studies. Students will drive discussions and participate heavily.
- **PBHL-H 781 Research Design in Health Policy and Management Research (3 credits):** This course exposes PhD students to research designs used in health policy and management literature. Topics covered include types of study designs including their benefits and drawbacks with a strong focus on casual inference. Students will gain an improved grasp of the interdisciplinary language of HPM research.
- **PBHL-H 783 Qualitative Methods (3 credits):** This is a qualitative research methods course for doctoral students. Emphasis will be placed on ethnographic field methods as they apply to understanding the organization, implementation, and evaluation of health services. Students will: learn qualitative research design; collect, manage, and analyze qualitative data; and report qualitative findings.
- **PBHL-H 799 Dissertation Proposal (4 credits):** This course will provide students with time to prepare for the qualifying examination and prepare their dissertation prospectus. The prospectus includes the information required by the IU Indianapolis Graduate School.
- **PBHL-H 800 Doctoral Dissertation Research (17 credits):** The dissertation will be written on an original topic of research and presented as one of the final requirements for the PhD degree. The dissertation must be an original contribution to knowledge and of high scholarly merit. The candidate's research must reveal critical ability and powers of imagination and synthesis. The dissertation is written under the supervision of a research director and a research committee. The data used by the student may involve analysis of primary or secondary data.
- **PBHL-P 504 U.S. Healthcare System and Health Policy (3 credits):** This course examines the US health care and public health systems including the structure, components, and financing of these systems. Ethical concepts, policy making, implementation, and impacts of major health care and public health policies will be discussed.
- **PBHL-P 517 Fundamentals of Epidemiology (3 credits):** This course will introduce students to basic epidemiologic concepts including determinants of health and patterns of disease in populations, population health descriptive techniques, use of health indicators and secondary data sources. Students will gain an understanding of the role of Epidemiology in developing prevention strategies and policy. Among the topics to be covered are measures of mortality and morbidity, design and analysis of observational studies, community health assessment and program evaluation.
- **PBHL-P 747 Population Health Science Research Seminar (fall) (3 credits):** This course develops students' ability to critically appraise, design, and defend Population Health Science research. Offered in a seminar format, it supports PhD students at all stages through repeated enrollment. Sessions feature roundtable discussions of published and proposed studies, with students expected to engage actively and lead substantive scholarly dialogue.
- **MGEN-G 788/INFO-I 590 Intro to the Next Generation Sequencing Technology (3 credits)**
- **INFO-B 636 Next Generation Genomic Data Analysis (3 credits)**

Psychology

Department of Psychology

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Phone: (317) 274-6947; fax: (317) 274-6756

Department URL: science.indianapolis.iu.edu/psychology

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Department Chair: Melissa Cyders, Ph.D.

Graduate Program Directors:

- Jesse Stewart, Ph.D. (Director of Graduate Studies)
- Cristine Czachowski, Ph.D. (Addiction Neuroscience)
- David Rusbasan, Ph.D. (Industrial/Organizational Psychology)
- Kendra Ray Stewart, Ph.D. (Clinical Psychology)

Curriculum

Courses

Degrees Offered

Master of Science (M.S.) in Psychology in Industrial/Organizational Psychology

Doctor of Philosophy (Ph.D.) in Addiction Neuroscience

Doctor of Philosophy (Ph.D.) in Clinical Psychology

PhD Minor in Psychology of Teaching

PhD Minor in Statistics for Social & Behavioral Sciences

Master of Science (M.S.) in Psychology in Industrial/Organizational Psychology

The Industrial/Organizational Psychology M.S. program is designed to prepare individuals for positions in industry or for entry into an industrial/organizational doctoral program. Students are familiarized with the scientist-practitioner model, which emphasizes both research and the application of problem-solving skills to organizational problems. Students in the program are taught analytic methods for diagnosing work-related problems, developing solutions, and evaluating the effectiveness of those solutions. The curriculum focuses on both the traditional personnel psychology areas of selection, training, compensation, and performance evaluation as well as topics of organizational psychology, such as decision-making, motivation, leadership, and organizational effectiveness. The M.S. degree can be completed on a full or part-time basis and typically takes one and a half years to finish. A minimum of 30 credit hours is required, including departmental core, area core, and elective courses.

Admission Requirements – Undergraduate training in psychology, mathematics, and the sciences is highly desirable though not required; we will consider applicants with bachelor's degrees in similar areas with coursework in social science statistics and research methods. Required specific coursework is an introductory psychology course, an undergraduate course in statistics, and an undergraduate course in research methodology. To be competitive, applicants should have: (a) an undergraduate (and graduate if applicable) grade point average of 3.20 or higher on a 4.00 scale, (b) three favorable letters of recommendation, ideally from faculty or others who can speak to the applicant's preparation for graduate level work in psychology, (c) a personal statement expressing an interest in industrial/organizational psychology, and (d) relevant research experience, preferably in psychology or a related social science.

Program Learning Outcomes

- Demonstrate mastery of knowledge of the core content areas of *organizational psychology* (e.g., staffing, human resources and organizational

development, work motivation, leadership, and group/team performance) and personnel psychology (e.g., selection, training, compensation, and performance evaluation).

- Apply theory, methodologies, and data analytic procedures to conduct research on topics relevant to organizations and society.
- Synthesize and critically evaluate psychological theory and research as it relates to human cognition, emotion, and behavior in social and organizational settings.
- Apply skills in the conceptualization, implementation, and evaluation of scientifically-based interventions intended to improve organizational functioning and provide evidence-based solutions to societal problems.
- Communicate effectively with both professional peers and the general public.
- Demonstrate awareness of, appreciation for, and the interpersonal skills necessary to address human diversity.
- Behave ethically and professionally in accordance with the APA Ethics Code in research and in personal and professional settings.

PROGRAM REQUIREMENTS

General Requirements:

- Take at least 30 credits in total
- Must maintain Program GPA of at least 3.000
- Minimum grade of B

Statistics and Research Methods (9 credits)

- PSY-I 600 Statistical Inference
- PSY-I 601 Correlation and Experimental Design
- PSY-I 681 Seminar in Research Methodologies of I/O Psychology

I/O Core Courses (15 credits)

- PSY-I 571 Staffing
- PSY-I 572 Organizational Psychology
- PSY-I 576 Human Resource Development
- PSY-I 682 Advanced Seminar in I/O Psychology
- PSY-I 685 Professional Seminar in Industrial/Organizational Psychology

Elective Courses (6 credits)

- PSY-I 579 Foundations of Diversity Science
- PSY-I 647 Attitudes and Social Cognition
- PSY-I 684 Practicum in Industrial-Organizational Psychology
- PSY-I 605 Applied Multivariate Analysis
- PSY-I 558 Advanced Introduction to Industrial and Organizational Psychology
- SPEA-L 586 Advanced Compensation & Benefits for HR Leaders
- SPEA-L 584 Advanced Employee Relations and Regulations
- SPEA-L 579 Advanced Workforce Planning and Processes
- SPEA-L 532 Advanced Leadership Theory and Practice
- SPEA-L 552 Strategic Decision-Making for Leaders

- SPEA-L 571 Advanced Project Management for Leaders
- SPEA-L 585 Advanced Leadership for Quality and Productivity
- SPEA-L 582 Advanced Human Resource Development
- SPEA-L 583 Advanced Coaching and Mentoring for Leaders
- SPEA-V 513 Managing Change and Organizational Development
- SPEA-V 522 Human Resource Management in Nonprofits
- SPEA-V 566 Executive Leadership

Doctor of Philosophy (Ph.D.) in Addiction Neuroscience

Program Description– The Addiction Neuroscience Ph.D. program is designed to foster a comprehensive understanding of the neurobiological bases of behavior, with an emphasis on the behavioral and neurobiological aspects of drug abuse and addictive behaviors. The program's goals are to develop knowledge and expertise in the neurobiological mechanisms of behavior, to develop skills for applying behavioral neuroscience research methods to problems of alcohol and drug abuse and addiction, and to train competence in communicating and teaching neuroscience research. The curriculum provides broad training in both the neurosciences (e.g., behavioral and developmental neuroscience, psychopharmacology, neurobiology) and behavioral sciences (e.g., experimental and cognitive psychology, learning, experimental design and analysis, animal models of drug abuse and addiction). A minimum of **90 credit hours** (post-baccalaureate) is required, and a student's plan of study must be approved by their advisory committee. Graduates are prepared for research and/or teaching careers in academic settings, medical institutions, pharmaceutical companies, and government agencies.

Admission Requirements – This Ph.D. program is intended for students interested in academic or research careers in addiction neuroscience. Successful applicants typically have an **undergraduate (and graduate, if applicable) GPA of 3.20 or higher** (on a 4.00 scale); **three favorable letters of recommendation**; and a **personal statement** expressing interest in addiction neuroscience. Students with undergraduate degrees in **psychology or the life sciences** (e.g., biology, chemistry, neuroscience) are encouraged to apply, although other degrees (with appropriate coursework) will be given full consideration. Admission is **for Fall entry only**, and the deadline for all application materials is **December 1**.

(Refer to the Department of Psychology website for detailed admission requirements and application instructions. Questions may be emailed to the graduate program coordinator at gradpsy@iu.edu.)

PROGRAM LEARNING OUTCOMES

Doctor of Philosophy in Addiction Neuroscience (Ph.D.)

- Demonstrate knowledge of key concepts in the psychological and brain sciences, including methods, history, and theoretical and empirical foundations, with special emphasis on the neuroscience of addiction.
- Demonstrate the knowledge and skills necessary to conduct, analyze, interpret, and communicate original research and scholarship in behavioral neuroscience, particularly in addiction neuroscience.
- Demonstrate understanding of the neural mechanisms and processes associated with the causes and consequences of substance abuse, including integration across genetic, neurobiological, developmental, and behavioral levels.
- Think critically and creatively to solve problems and generate new knowledge in behavioral neuroscience, with application to the problems of drug abuse and addiction.
- Conduct research in behavioral and addiction neuroscience in an ethical and responsible manner.

Plan of Study

- **Core curriculum (15 cr.)** for Addiction Neuroscience includes:
 - PSY-I 570 Drugs of Abuse
 - PSY-I 590 Individual Research Problems: Animal Models
 - PSY-I 600 Statistical Inference
 - PSY-I 601 Correlation and Experimental Design
 - PSY-I 615 Behavioral Neuroscience
- **Specialty courses (18 cr.)**
 - PSY-I 545 Psychopharmacology
 - PSY-I 560 Behavioral Genetics
 - PSY-I 591 Psychopathology
 - PSY-I 622 Animal Learning
 - PSY-I 675 Human Neuropsychology
 - ANAT-D 527 Neuroanatomy
 - BIOL-I 560 Clinical & Molecular Aspects of Neurodegenerative Diseases
 - BIOL-I 564 Molecular Genetics of Development.
- **Seminar (1 cr.)**
 - PSY-I 590 Addiction Seminar (enrollment required every semester).
- **Minor (6 cr.):** An approved minor (selected with advisor) is required and may be taken within the School of Science or any IU Indianapolis school.
- **Additional requirements** include: at least two semesters of teaching experience (as a teaching assistant or instructor in undergraduate psychology courses); **thesis requirement** (minimum 3 credits, maximum 6 credits); **qualifying exam** students should choose from one of two types: a grant proposal, or critical, synthetic research review for publication; **dissertation requirement**; **oral defenses** of the thesis proposal, the preliminary research proposal, and the dissertation. The proposal is 2-3-pages and should include the rationale, Aims, and detailed enough methods for the committee to review. It will be prepared for a meeting of the Committee and then expanded to 5-7 pages after defense and approval by the Committee.

Graduation requirements include: a **minimum grade of B** in each course (**no grades below B– count toward the**

degree); a **minimum GPA of 3.00** for graduation; **90 total credit hours**; and a residency requirement (students must be in residence for the duration of the program).

Doctor of Philosophy (Ph.D.) in Clinical Psychology

Program Description– The Clinical Psychology Ph.D. program integrates the assessment and intervention strategies of evidence-based clinical psychology with health/rehabilitation psychology's emphasis on optimizing the adaptation of individuals with chronic, disabling medical conditions. The program addresses the psychological and social consequences of physical and mental conditions. As scientists, faculty and students study behaviors, experiences, and attitudes of people with disabilities and illness, develop and assess theoretical models of how behavior, health, and illness interact, and develop and evaluate treatment approaches. As practitioners, students learn to assess individuals and their environments, plan and implement psychosocial interventions, and monitor progress over time. The program emphasizes the acquisition of the methods, theories, and knowledge of behavioral science along with the practitioner skills of clinical psychology. Faculty expertise and student experiences center around the areas of clinical health psychology and dual diagnosis (severe mental illness/psychiatric rehabilitation and substance use). There is a strong emphasis on research, consistent with a *clinical science* model of training. Graduates will be qualified for positions as academics, evaluators, researchers, trainers, consultants, and direct clinical service providers. Full-time study is required, with a minimum of 90 credit hours (post-baccalaureate), and it is expected to take six years to complete the program. Faculty review all students twice per year to ensure satisfactory academic progression. Students must be in residence until the pre-doctoral internship year, with rare exceptions considered for no more than one year. A temporary leave of absence may be requested in accordance with School of Science policies.

Admission Requirements – A bachelor's degree from an accredited institution is required. Admission to the Clinical Psychology Ph.D. program is competitive, and only under unusual circumstances will applicants be considered if they do not meet the following minimum standards: (a) an undergraduate (and graduate, if applicable) GPA of 3.20 or higher on a 4.00 scale; (b) three favorable letters of recommendation; and (c) a personal statement expressing interest in the field of clinical psychology. Prior research experience is strongly recommended. Except in unusual cases, admitted students will have completed at least 15 credit hours in psychology (and although there are no specific course prerequisites, applicants without coursework in research methods, statistics, and abnormal psychology may be asked to complete remedial study in those areas prior to enrolling in graduate courses).

*(Admission is for Fall entry only, with application materials due by **December 1**. See the Department of Psychology website for further details on admission requirements and applying. Questions may be directed to gradpsy@iu.edu.)*

PROGRAM LEARNING OUTCOMES

- Demonstrate knowledge in the breadth of scientific psychology, including historical perspectives of its foundations and development.
- Demonstrate knowledge of theory, methodology, and data analytic skills related to psychological research.
- Demonstrate the ability to generate new scientific knowledge and theory related to the field of psychology.

Program Requirements

- **Core courses(15 cr.)**
 - PSY-I 591 Psychopathology
 - PSY-I 664 Psychological Assessment I
 - PSY-I 665 Intervention I: Counseling Approaches
 - PSY-I 666 Intervention II: Cognitive-Behavioral Intervention
 - PSY-I 669 Psychological Assessment II
- **Statistics and research methods courses(12 cr.)**
 - PSY-I 600 Statistical Inference
 - PSY-I 601 Correlation and Experimental Design
 - PSY-I 590 Meta-analysis and Systematic Review
 - One additional approved statistics or research methods course
- **Ethical, Legal, and Cultural Issues in Psychology, PSY-I670(3 cr.)**
- **Psychology Breadth and Advanced Integrative Knowledge in Scientific Psychology (6 cr.)**
- PSY-I 565 Seminar in Cognitive, Affective, and Social Aspects of Behavior
- PSY-I 535 Developmental Neuroscience
- **Practicum (12 cr.)**consists of internal and external clinical placements
 - PSY-I 689 Practicum in Clinical Psychology.
- **Professional development(5 cr.)**
 - PSY-I 590 Advanced Professional Development Seminar
 - PSY-I 590 Advanced Clinical Intervention
 - PSY-I 691 Seminar/Area Meeting.
- **Electives (minimum 15 cr.)**
 - PSY-I 570 Drugs of Abuse
 - PSY-I 572 Organizational Psychology
 - PSY-I 590 Individual Research Problems
 - PSY-I 605 Applied Multivariate Analysis
 - PSY-I 608 Measurement Theory and the Interpretation of Data
 - PSY-I 611 Factor Analysis
 - PSY-I 622 Animal Learning
 - PSY-I 647 Attitudes and Social Cognition
 - PSY-I 540 Seminar in Psychological Treatment and Recovery of Alcohol and Substance Use
 - PSY-I 545 Psychopharmacology
 - PSY-I 613 Psychiatric Rehabilitation
 - PSY-I 614 Behavioral Medicine in Rehabilitation
 - PSY-I 618 Interventions in Health Psychology
 - PSY-I 689 Practicum in Clinical Psychology

Additional requirements include an empirical **thesis (3 cr.)** and **dissertation (12 cr.)**, both of which include a written product and an oral defense. Students must also complete an approved **minor (6 cr.)**. A qualifying (preliminary) examination (in the form of a publication-quality critical literature review and oral defense) occurs after completion of most formal coursework and the thesis. Upon passing the qualifying exam, the student advances to candidacy. Students complete a required 1-year predoctoral **internship in clinical psychology (1 cr.)** prior to graduating from the program.

Psychology Minors in the School of Science

Psychology of Teaching (6 credits)

- PSY-I 595 Seminar in Teaching Psychology
- PSY-I 596 Advanced Seminar in the Psychology of Teaching

Statistics for Social & Behavioral Sciences (6 credits)

- PSY-I 600 Statistical Inference
- PSY-I 601 Correlation and Experimental Design

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

COURSE DESCRIPTIONS

PSY-I 535 Developmental Neuroscience (3 cr.)

P: Graduate standing in Psychology or permission of instructor. Course will examine the nature of how biological and developmental alterations lead to aberrant behaviors that define psychopathology. Course covers theories of development and neuroscience, including methods of study. Discussion of the ethics involved in the field of Developmental Neuroscience.

PSY-I 544 Psychobiology of Learning and Motivation (3 cr.) P: PSY-B 320 or equivalent. The course examines past and present biologically based theories of learned and motivated behavior. Neural processes of feeding, drinking, aggression, fear, anxiety, and sexual behavior will be emphasized. Selected coverage of behavioral research principles used to investigate these processes also will be discussed.

PSY-I 545 Psychopharmacology (3 cr.) P: PSY-I 615 or consent of instructor. A survey of the effects of drugs on behavior, cognitive functioning, and emotions. Emphasis will be placed on the practical advantages of understanding how psychotropic drugs work, and on how the brain functions in health and disease. Students will be exposed to the most current theories and research in the field.

PSY-I 565 Seminar in Cognitive, Affective, and Social Aspects of Behavior (3 cr.) P: Prerequisite: Graduate standing in Psychology or permission of instructor. Students examine key ideas in cognitive, affective and social aspects of behavior. This course provides a solid foundation in psychology including substantive breadth of cognitive, affective and social psychology for graduate students in psychology and allied disciplines.

PSY-I 571 Staffing (3 cr.) Spring. This seminar course will introduce students to HR practices associated

with bringing new members into organizations. Topics covered include recruitment, procedures for assessing the individual differences of applicants, models used to make selection decisions, and legal considerations associated with personnel selection (e.g., discrimination and affirmative action). The course will focus on theory and empirical research related primarily to the fields of industrial/organizational psychology and management.

PSY-I 570 Drugs of Abuse (3 cr.) P: Graduate: None Undergraduate: Permission of instructor pending review of prior undergraduate course work. This course will cover the basic principles of the study of drugs of abuse, as well as focusing on particular drugs and drug classes. For each drug or drug class, we will discuss issues ranging from basic pharmacology to the social impact of the abuse of the particular substance. We will utilize a text book as well as current literature in the field, and critical examination of all course material will be encouraged.

PSY-I 572 Organizational Psychology (3 cr.) A survey of basic behavioral science research and thinking as these contribute to the understanding of individual, dyadic, group, intergroup, and other large organization behavioral phenomena. The topics covered include motivation, perception, attitudes and morale, communication, leadership, conflict, problem solving, behavior change, and organizational effectiveness.

PSY-I 573 Occupational Health Psychology (3 cr.) P: Regular graduate standing in Psychology or permission of instructor. Fall, every other year. Occupational health psychology (OHP) is one of the most heavily researched areas within the work domain, although it is not well publicized in the traditional IO psychology domain. For instance, traditional topics in IO, such as job design (job characteristic model), person- environment fit, shift work, job stress, coping and adjustment, type A/B, safety climate, workplace violence, and so on, are covered in the OHP. This course provides an in depth treatment of this literature with the foci on occupational stress, violence, and safety.

PSY-I 575 Psychology and Law Seminar (3 cr.) P: Permission of instructor. Fall, every other year. This seminar examines the relevance of social psychological and industrial/organizational (I/O) theory and research to various forensic contexts, including criminal and tortious behavior, police and other investigatory processes, evaluation of scientific and behavioral evidence, employment law issues, and the role of psychological consultants and expert witnesses.

PSY-I 576 Human Resource Development (3 cr.) Spring. This is a graduate level course intended for individuals who are seeking advanced training in the science and practice of employee development. Employee Development is construed broadly in this course to include performance management and employee training. Students will be exposed to the critical extant literature, to best practices in the development of these human resources systems in organizations, and will gain applied experience through course projects.

PSY-I 578 Occupational Analysis (3 cr.) P: PSY-I 570. Survey of systematic study of human work, including techniques for analyzing jobs and occupations for

personnel and related purposes. Survey of occupational research and related topics. Practice in job analysis.

PSY-I 581 Gender Issues in the Workplace (3 cr.) P: Regular graduate standing in Psychology or instructor permission. Spring. This is a graduate seminar that examines women's (and by comparison, men's) experiences in the workplace, with a focus on intersectionality. Topics will span the psychological and related social science literature on gender issues in career interests, occupational decisions, work experiences, advancement, discrimination, and organizational interventions to address these issues.

PSY-I 582 Organizational Diversity and Intergroup Relations (3 cr.) P: Regular graduate standing in Psychology or permission from instructor. Spring, every other year. Examines the importance of diversity in groups, discrimination and biases in organizations, minority and majority group reactions to different diversity initiatives, the unintended consequences of diversity initiatives, and the importance of empirically validating diversity interventions and trainings.

PSY-I 583 Judgment and Decision Making in Organizations (3 cr.) P: Regular graduate standing in Psychology or instructor permission. Fall, as needed. This graduate seminar examines how decisions are made by individuals and groups in various organizational and institutional settings. Topics covered include how individuals process information, make judgments, and reach decisions; how groups reach decisions through interactive social processes; and how choices, decisions and plans are formulated by individuals and groups in selected real-world contexts (e.g., legal, medical, politics, sports, business, etc.). The course will rely heavily on theory and research in psychology, but also draw on the scholarly literature in related social science fields (e.g., sociology).

PSY-I 588 Advanced Introduction to Industrial and Organizational Psychology (3 cr.) Industrial/Organizational (I/O) psychology is the study of behaviors, thoughts, and feelings of people as they adjust to their workplace, and the use of that information to maximize the economic and psychological well-being of employees and their organizations. This course concentrates heavily on I/O science and practice for human resource activities.

PSY-I 590 Individual Research Problems (1-3 cr.) P: Twelve (12) credit hours of psychology and consent of instructor. Opportunity for students to study particular problems in any field of psychology or to learn research techniques under the guidance of a faculty member.

PSY-I 591 Psychopathology (3 cr.) P: Enrollment in psychology graduate program or consent of instructor. An intensive survey of the methods, theories, and research concerning the nature, causes, and development of psychopathology. An evaluation of current systems of assessment and classification of abnormal behavior is emphasized.

PSY-I 595 Seminar in Teaching Psychology (0-3 cr.) P: Consent of the Department of Psychology. A problem-solving approach to teaching psychology at IU Indianapolis. Planning the course; anticipating problems; and dealing with ongoing teaching problems. Current faculty members will present their innovative techniques.

Participants will evaluate each other's classroom performance.

PSY-I 596 Advanced Seminar in the Psychology of Teaching (3 cr.) P: PSY-I 595 Seminar in Teaching Psychology. This experiential seminar focuses on applying best practices in teaching. In this class, you will think deeply about your goals as an instructor, prepare and lead a class session, critique your own and other's instructional practices, expand your knowledge of evidence-based teaching practices, and develop a reflective approach to teaching.

PSY-I 600 Statistical Inference (3 cr.) P: Student must be a degree-seeking student in psychology graduate program or have consent of instructor and PSY-B 305 or equivalent. Emphasis on principles underlying both parametric and nonparametric inference.

PSY-I 601 Correlation and Experimental Design (3 cr.) P: PSY-I 600. Continuation of PSY-I 600, with emphasis on the design and analysis of experiments.

PSY-I 605 Applied Multivariate Analysis (3 cr.) P: PSY-I 600. A survey of the most frequently employed multivariate research techniques, such as multivariate generalizations of univariate tests and analysis of variance, principal components, canonical analysis, and discriminant analysis. A central theme of the course is the general linear model, both univariate and multivariate. A multipurpose program for this model provides the student with practical experience in conducting multivariate research.

PSY-I 608 Measurement Theory and the Interpretation of Data (3 cr.) P: PSY-I 600 and PSY-B 307, or equivalent. The theory of measurement and the development of reliability and the Spearman-Brown equations, true scores and variables, and correction for attenuation. Variance or covariance of combinations of variables. Item analysis and test construction strategies. Reliability and validity of measurements and the influence of measurement error and measurement threats to research design.

PSY-I 609 Multilevel Modeling (3 cr.) P: PSY-I 601 or equivalent. Course includes (1) generalized linear mixed (multilevel) models often used in social sciences; (2) best practices in the models' applications and interpretations. Models are extensions of classic linear regression models (multilevel modes, hierarchical and mixed models, etc.). Conceptual introduction of models and methods and illustrations using real and simulated data.

PSY-I 614 Behavioral Medicine in Rehabilitation (3 cr.) P: Consent of instructor. The theory and practice of behavioral medicine will be explored. Emphasis is on the application of behavioral principles to individuals suffering from various chronic diseases or disabilities including spinal cord injury, chronic pain, cancer, diabetes, strokes, cardiovascular diseases, and epilepsy.

PSY-I 615 Introduction to Psychobiology (3 cr.) P: Consent of instructor. A survey of the integrated neurosciences emphasizing physiological psychology. Neural processes of sensory and motor function, arousal and sleep, motivation, learning and memory, language function, and personality disorders will be presented with selected coverage of neuroanatomy, neurophysiology,

neuropharmacology, and neuroendocrinology. Both normal and pathological functions will be covered.

PSY-I 618 Interventions in Health Psychology (3 cr.)

P: Consent of instructor. The goal of the course is to familiarize students with clinical interventions and research relevant to health problems and lifestyle. This will enable students to critically evaluate the work that has been accomplished and to design and implement intervention protocols.

PSY-I 622 Animal Learning (3 cr.) A survey of the methods, problems, and research in Pavlovian, instrumental, and operant conditioning. Current issues and attempts at theoretical integration are highlighted. Emphasis is also given to the empirical and conceptual foundations of the present views on the mechanisms governing learned behavior.

PSY-I 664 Psychological Assessment I (3 cr.) P: Consent of instructor. Presentation of general principles of psychological assessment, professional practice, interviewing, intelligence/cognitive assessment, and psychological report writing. Supervised practice in the development of direct service skills in interviewing, behavioral observation, and psychometric assessment of cognitive abilities. Emphasis on functional implications of test results for rehabilitation populations.

PSY-I 665 Intervention I: Counseling Approaches (3 cr.) P: Consent of instructor. Introduces doctoral students to intervention procedures used in rehabilitation psychology. The course has both didactic and clinical skills components, involving traditional counseling interventions, behavior therapy, and biofeedback. Applications to disabled populations will be emphasized.

PSY-I 666 Intervention II: Cognitive Behavioral Interventions (3 cr.) P: Consent of instructor. This course covers the history, theory, research, and clinical application of cognitive-behavioral therapy (CBT). General CBT principles and clinical skills, as well as CBT programs for specific disorders/problems are reviewed. Diversity-related discussions are infused throughout, and general and specific approaches to culturally adapting CBT are presented.

PSY-I 669 Psychological Assessment II (3 cr.) P: PSY-I 664 and consent of instructor. Presentation of psychometric foundations and the basic prediction model in personality/interest assessment. Coverage of the history of personality, assessment, personality development, and supervised clinical practice in personality/interest assessment in rehabilitation. Emphasis on prediction of everyday functioning.

PSY-I 670 Ethical, Legal, and Cultural Issues in Psychology (3 cr.) P: Admission to graduate training in psychology or consent of instructor. Exploration of models of ethical decision making. Examination of ethical principles and legal mandates that apply to professional psychology including psychologists' roles in health care service delivery, consultation (clinical and organizational), research, and teaching. Examination of cultural issues, including issues related to ethnicity, age, gender, religion, and sexual orientation.

PSY-I 680 Seminar in Industrial-Personnel Psychology (3 cr.) P: PSY-I 570, PSY-I 572, and PSY-I 601.

Extensively surveys the various areas of industrial-personnel psychology (e.g., selection, placement, training, performance appraisal). Provides a critical and up-to-date review of recent and classical research in these areas.

PSY-I 681 Seminar in Methodologies of Industrial/Organizational Psychology (3 cr.) P: PSY-I 570, PSY-I 601, or consent of instructor. Intensive analysis of application of various applied, research, and statistical methods to the study of human behavior in organizational settings.

PSY-I 682 Advanced Seminar in Industrial/Organizational Psychology (3 cr.) P: PSY-I 570, PSY-I 572, or equivalent. Special topics in industrial and organizational psychology are offered on a rotating basis. Examples of the special topics are work motivation, leadership, advanced selection and placement, and performance appraisal. One topic will be treated each semester.

PSY-I 684 Practicum in Industrial/Organizational Psychology (3 cr.) P: PSY-I 570, PSY-I 572, and consent of instructor. Practical experience in the development and implementation of field research in organizational settings. Gives students the opportunity to spend eight hours per week in local business organizations to gain experience and skills in industrial/organizational psychology.

PSY-I 685 Professional Seminar in Industrial/Organizational Psychology (1 cr.) P: Regular graduate standing in the Industrial/Organizational Psychology graduate program. This seminar facilitates the professional development of students in Industrial/Organizational Psychology. Presentations and discussions occur each week; topics will vary. Presentations are conducted by outside speakers, faculty and/or students on applied and research-oriented topics. During facilitated discussions, students will review newly published research and address ethics in the discipline.

PSY-I 689 Practicum in Clinical Psychology (3 cr.) P: PSY-I 549 and consent of instructor. Supervised practice of rehabilitation psychology in a community agency or organization.

PSY-I 691 Seminar in Clinical Psychology (1 cr.) P: Consent of instructor. Current trends, problems, and developments in clinical psychology. Students pursue a special interest and mutually share information and experience with the group. Individual report and group discussions.

PSY-I 697 Internship in Clinical Psychology (0-9 cr.) P: Consent of instructor. Opportunities for application of theory and practice of rehabilitation psychology and case management in a rehabilitation setting under supervision of the Department of Psychology and the agency.

PSY-I 698 Research M.S. Thesis (3 cr.) Research M.S. Thesis.

PSY-I 699 Research Ph.D. Thesis (0-12 cr.) Research Ph.D. Thesis.

PSY-G 901 Advanced Research (6 cr.)

Public Health

Richard M. Fairbanks School of Public Health

Program E-mail: fsphinfo@iu.edu

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctoral/minors/public-health

Doctoral Minor in Public Health

The IU Richard M. Fairbanks School of Public Health offers a PhD minor in Public Health that provides students with a foundation in the concepts, principles and practice of public health. People who possess these specialized skills are in high demand because of the population health perspective they can contribute to many doctoral-level research projects.

The doctoral minor in Public Health is a rigorous, highly focused 12-credit hour minor that serves as a useful complement to many major areas of study. You will learn both theoretical concepts and how to apply them. By completing this minor, you will be able to:

- Use biostatistical methods to analyze and report public health data
- Specify approaches to assess, prevent, and control environmental and occupational hazards to human health and safety
- Use epidemiologic methods to collect, study, analyze, and report the patterns of disease in human populations for diverse audiences
- Identify and analyze the components and issues of leadership, including financing and delivery of public health services and systems
- Apply policy process, development, and analysis methods to address current national, state, and local public health issues
- Identify social and behavioral sciences factors, theories, and models, and develop, implement, and evaluate interventions designed to positively affect health behaviors in populations
- Collect and disseminate public health data through the use of technology and media
- Explain how human biology influences health and public health practice
- Exhibit high standards of personal and organizational integrity, compassion, honesty, and respect for all people
- Use systems methods to analyze the effects of political, social, and economic influences on public health systems at the individual, community, state, national, and international levels
- Demonstrate the impact of diversity and culture on public health across discipline areas
- Demonstrate an understanding of the basic ethical and legal principles pertaining to the collection, maintenance, use, and dissemination of public health data

This minor is ideal for students from many schools, including the IU schools of Nursing, Dentistry, Medicine, Physical Education and Recreation, Health Rehabilitative Sciences, Law, and Public and Environmental Affairs.

Students who wish to obtain a doctoral minor from the IU Richard M. Fairbanks School of Public Health must earn a grade of "B" or better in the coursework for the minor.

Courses in which a grade of "B-" or lower is earned will not apply toward completion of the minor.

Choose four courses for 12 credit hours.

- PBHL-P 510 Introduction to Public Health (3 credits)
- PBHL-P 500 Social and Behavioral Science in Public Health (3 credits)
- PBHL-P 551 Biostatistics for Public Health (3 credits)
- PBHL-P 519 Environmental Science in Public Health (3 credits)
- PBHL-P 517 Fundamentals of Epidemiology (3 credits)
- PBHL-P 504 U.S. Healthcare Sys. & Health Policy (3 credits)

Other courses may be taken if approved by the student's minor advisor. Students who have already completed any of the required courses as part of their MPH or PhD requirements may not apply those courses toward their minor in public health and must instead work with their faculty advisor to identify alternate courses.

Courses

- **PBHL-P 510 Introduction to Public Health (3 credits):** Students will learn the basic foundations and disciplines of public health. Explore the public health impact where populations live, work and play will be covered. Students will develop tools to examine issues and create solutions through a public health lens.
- **PBHL-P 500 Social and Behavioral Science in Public Health (3 credits):** This course is designed to introduce students to the social and behavioral science principles that provide the foundation for health program planning and disease prevention with an emphasis on population-based public health approaches. Students will explore topics that promote a broader and better understanding of determinants of health; the multiple factors contributing to health and illness behaviors; and the fundamentals, theories and principles that shed light on health and illness behaviors.
- **PBHL-P 551 Biostatistics for Public Health (3 credits):** This course introduces the principles and methods of data analysis using R studio in public health biostatistics. Emphasizing public health examples as they relate to concepts like sampling, study design, descriptive statistics, probability, statistical distributions, estimation, hypothesis testing, chi-square tests, t-tests, analysis of variance, linear regression and correlation.
- **PBHL-P 519 Environmental Science in Public Health (3 credits):** The course focuses on Environmental Health which is the branch of public health that protects against the effects of environmental hazards that can adversely affect health or the ecological balances essential to human health and environmental quality. The environment influences many aspects of human health and well-being. Many diseases are initiated, promoted, sustained, or stimulated by environmental factors. For these reasons, the interactions people have with their environment are an important component of public health.
- **PBHL-P 517 Fundamentals of Epidemiology (3 credits):** This course will introduce students to

basic epidemiologic concepts including determinants of health and patterns of disease in populations, population health descriptive techniques, use of health indicators and secondary data sources. Students will gain an understanding of the role of Epidemiology in developing prevention strategies and policy. Among the topics to be covered are measures of mortality and morbidity, design and analysis of observational studies, community health assessment and program evaluation.

- **PBHL-P 504 U.S. Healthcare Sys. & Health Policy (3 credits):** This course examines the US health care and public health systems including the structure, components, and financing of these systems. Ethical concepts, policy making, implementation, and impacts of major health care and public health policies will be discussed.

Social Work

School of Social Work

Departmental URL: socialwork.iu.edu

Departmental E-mail: Barbara Pierce, PhD
barjpier@iu.edu

Curriculum

Degree Offered

Doctor of Philosophy Degree, Doctor of Philosophy Minor. The Ph.D. in Social Work is offered in person on the IU Indianapolis campus.

Doctor of Philosophy Degree

Admission Requirements

All applicants to the Ph.D. program must have a master's degree. The MSW/MSS is highly preferred, but, but related field will be considered. Admission to the Ph.D. program is based on evaluations of: (1) the applicant's professional resume, (2) professional experience beyond the M.S.W. degree, (3) all undergraduate and graduate transcripts, (4) three online references preferably from former professors, (5) an example of the applicant's scholarly writing (this may include publications), and (6) a 750-word statement of purpose which includes why a PhD is your chosen path, your area of interest for inquiry, and a tentative research question.

Application Deadlines

Applications are due annually by December 1st. Application materials and further information may be obtained online at: socialwork.iu.edu/admissions/phd.

Course Requirements

A total of 90 credit hours, including dissertation and research internship. Must maintain a minimum grade of B. Specific program requirements include: (1) foundation courses (30 credit hours), (2) specialization courses (18 credit hours), (3) research component (30 credit hours which includes 6 credits of research internship, (4) dissertation (12 credits).

Foundation Research Courses (15 credits):

- SWK-S 718 INTRODUCTORY STATISTICS IN SOCIAL SCIENCE

- SWK-S 720 PHILOSOPHY OF SCIENCE AND SOCIAL WORK
- SWK-S 721 PREPARING TO PUBLISH: SCHOLARLY WRITING SEMINAR
- Transfer Courses (6 credits): Take at least 6 credits from a course set manually defined by the institution

Foundation Non-Research Courses (15 credits)

- Take at least 15 credits from a course set manually defined by the institution

Research (30 credits total)

- SWK-S 725 Research Internship (6 credits)
- Advanced Social Work Courses (21 credits)
- SWK-S 710 SOCIAL WORK THEORIES OF HUMAN AND SOCIAL BEHAVIOR
- SWK-S 726 ADVANCED SOCIAL WORK RESEARCH: QUALITATIVE METHODS I
- SWK-S 727 ADVANCED SOCIAL WORK RESEARCH: QUANTITATIVE METHODS I
- SWK-S 728 MULTIVARIATE STATISTICS IN SOCIAL SCIENCE
- SWK-S 730 SOCIAL WORK POLICY ANALYSIS
- SWK-S 736 ADVANCED SOCIAL WORK RESEARCH: QUALITATIVE METHODS II
- SWK-S 737 ADVANCED SOCIAL WORK RESEARCH: QUANTITATIVE METHODS II
- Integrative Seminar (3 credits)
 - SWK-S 791 INTEGRATIVE SEMINAR
 - SWK-S 792 INTEGRATIVE SEMINAR II

Specialization (18 credits)

- Minor Requirements (12 credits)
- Electives (6 credits total)

Dissertation Research (12 credits total)

- SWK-S 800 Dissertation Research

Advisory Committee

The student selects three total, two members of the graduate social work faculty (one will chair) and one graduate faculty member from the minor. These members will grade the qualifying examination. Students may retain these faculty members for the research proposal and dissertation.

Qualifying Examination

Comprehensive; specific focus and scheduled during the summer between years two and three.

Research Proposal

After nomination to candidacy, the student, with the approval of the program director, will add a third graduate faculty member from social work which then complete the 4 member dissertation committee. Students may write a single or multiple manuscript dissertation.

Final Examination

Oral defense of dissertation.

Graduate Non-Degree Exploration

This option is designed to provide prospective Ph.D. students with an opportunity to explore their interests in research and doctoral education before making formal application to the Ph.D. program. Qualified students are admitted under a non-degree status and are permitted to enroll in up to three of the school's regular Ph.D. foundation courses (9 credit hours) before having to decide whether they intend to apply to the Ph.D. program. If later accepted to the Ph.D. program, credits earned during the pre-doctoral phase will automatically apply toward the Ph.D. degree. Participation in the Graduate non-degree option does not guarantee acceptance into the Ph.D. program. All inquiries regarding the graduate non-degree option should be directed to the PhD Program director listed above.

Ph.D. Minor in Social Work

A minor in social work requires the completion of at least 12 credit hours of graduate course work. Students must complete at least two courses from among the 700-level courses listed below. Remaining course requirements may be taken from among the school's 500- and 600-level courses with the approval of the director of the M.S.W. program and the course instructor. The choice of courses comprising the minor must be made in consultation with the Ph.D. program director and have the approval of the student's identified faculty advisor. These courses are currently approved options:

- SWK-S 710 SOCIAL WORK THEORIES OF HUMAN AND SOCIAL BEHAVIOR
- SWK-S 718 INTRODUCTORY STATISTICS IN SOCIAL SCIENCE
- SWK-S 720 PHILOSOPHY OF SCIENCE AND SOCIAL WORK
- SWK-S 721 PREPARING TO PUBLISH: SCHOLARLY WRITING SEMINAR
- SWK-S 724 SOCIAL WORK TEACHING
- SWK-S 730 SOCIAL WORK POLICY ANALYSIS
- SWK-S 727 ADVANCED SOCIAL WORK RESEARCH: QUANTITATIVE METHODS I
- SWK-S 726 ADVANCED SOCIAL WORK RESEARCH: QUALITATIVE METHODS I
- SWK-S 728 MULTIVARIATE STATISTICS IN SOCIAL SCIENCE
- SWK-S 732 COMMUNITY ENGAGED PARTICIPATORY RESEARCH (CEPR) APPROACHES TO IMPLEMENTATION AND EVALUATION
- SWK-S 736 ADVANCED SOCIAL WORK RESEARCH: QUALITATIVE METHODS II
- SWK-S 737 ADVANCED SOCIAL WORK RESEARCH: QUANTITATIVE METHODS II
- SWK-S 790 INDEPENDENT STUDY

Academic Advisor

Professor Barbara Pierce, Indiana University School of Social Work, 902 W. New York Street, Indianapolis, IN 46202, (317) 274-8760, barjpier@iu.edu

Courses

Social Work Courses

- **SWK-S 710 Development and Evaluation of Social Work Theories and Practice** (3 cr.) This course focuses on the nature of theories, models,

and perspectives that guide social work practice. Students develop the ability to identify, critique, and develop theories that can help Social Work effectively identify and resolve vital social problems, empower vulnerable populations, and advance the profession and our mission.

- **SWK-S 718 Intermediate Statistics for Social Workers** (3 cr.) Students will learn selected parametric and nonparametric statistics to examine research problems. Included in the learning process are hand computations of statistics development of skills in using a comprehensive computer statistics package and selection of statistical techniques based on levels of measurement and analyses of the assumptions of statistics.
- **SWK-S 720 Philosophy of Science and Social Work** (3 cr.) This course examines the nature and sources of social work knowledge and considers a range of epistemological issues involved in the selection, development, evaluation, and use of knowledge for social work.
- **SWK-S 721 Preparing to Publish: Seminar in Advanced Scholarship Skills** (3 cr.) This course prepares doctoral students for academic scholarship. Topics include expectations and standards for scholarly discourse, critical and analytical thinking skills, logical argument, scholarly writing and publication, and developing a research agenda. Web-based peer and instructor review of successive drafts of writing assignments culminate in a synthesized review of literature.
- **SWK-S 724 Theory, Practice, and Assessment of Social Work Teaching** (3 cr.) This course prepares doctoral students to effectively and competently teach social work courses. Content includes teaching philosophies; curriculum and syllabus development; teaching methods; technology related to teaching; assessment, testing, evaluation of students; and research related to teaching. Students will learn accreditation standards for bachelor's and master's social work education. Course goals will be accomplished using readings, written assignments, guest speakers, demonstrations of teaching, and class discussion.
- **SWK-S 725 Social Work Research Internship** (3 cr.) P: S720, S726, S727, or a foundation statistics course, and at least one of the following: S710, S730, or S740. This supervised field internship provides practical experience in conducting research relevant to social work practice. Students participate in a new or ongoing, faculty-supervised research project involving the design and implementation of a study, including the collection and analysis of data, and the development of appropriate research reports. Internship may be registered for up to three times.
- **SWK-S 726 Advanced Social Work Research: Qualitative Methods I** (3 cr.) Qualitative Methods I is the first of a two-course sequence designed to develop students' knowledge and skills in design, methods, strategies, and the challenges of qualitative research. This purpose of this course is to understand the role of theory and to critically

examine a variety of qualitative methods for data collection. Students will critically evaluate qualitative literature, research methods, and begin the process of framing a qualitative study.

- **SWK-S 727 Advanced Social Work Research: Quantitative Methods I** (3 cr.) Quantitative Methods I is designed to develop knowledge and skills in research designs and methods and addresses problems encountered in behavioral and social research. Students will critically evaluate quantitative research and ethics of scientific inquiry, develop a theoretically-motivated research question, and design a data collection strategy appropriate for that question.
- **SWK-S 728 Advanced Statistics for Social Work** (3 cr.) P: S718 Intermediate Statistics for Social Work. Students in this course learn how to evaluate statistical assumptions and select, compute, and substantively interpret a variety of multivariate statistics, using SPSS to analyze actual social work research data. Online resources, Web-based materials, and model applications of the statistics support students' learning.
- **SWK-S 730 ProSeminar on Social Work Policy Analysis** (3 cr.) This seminar focuses on the development and application of analytical tools necessary to critically examine and evaluate social policy theory and research germane to social work, including the values and ideologies that undergird social problem construction, social policy creation, and social program design. Specific attention is devoted to the application of these schemata for diverse populations.
- **SWK-S 732 Community Engaged Participatory Research Approaches to Implementation and Evaluation** (3cr.) This course reviews community engaged participatory research (CEPR) approaches and models of implementation science and evaluation in order to help researchers to create and sustain evidence-based programs and practices in collaboration with agencies and communities. Major topic areas include theoretical foundations, models, ethics, and development of a CEPR compliant project.
- **SWK-S 736 Advanced Social Work Research: Qualitative Methods II** (3 cr.) P: S726. Qualitative Methods II is the second of a two-course sequence designed to develop students' knowledge and skills in design, methods, strategies, and the challenges of qualitative research. This purpose of this course is to apply the knowledge of theory and qualitative methods to the development of a research question. Students will choose a theoretical approach for a qualitative study, a method of data collection, evaluate the appropriate literature, collect, analyze, and interpret qualitative data.
- **SWK-S 737 Advanced Social Work Research: Quantitative Methods II** (3 cr.) P: S727. Quantitative Methods II is the second course in the research sequence designed to further develop students' knowledge, skills, and application of research methods. Based on their research proposal developed in the first sequence class,

students will conduct their own research project and learn data collection and management, statistical analysis, interpretation of data, and writing a research report. Their learning will be facilitated through demonstrations and hands-on sessions in the computer lab as well as careful examination of application of research procedures in their own project.

- **SWK-S 791 Integrative Seminar I** (1.5 cr.) This course acquaints incoming doctoral students with campus resources for graduate students and with the expectations for doctoral education, including the policies, procedures, and academic standards of the Graduate School and of the School of Social Work. Students register for this seminar in their first semester.
- **SWK-S 792 Integrative Seminar II** (1.5 cr.) This course is intended to support Ph.D. students as they finish up doctoral coursework and prepare for their qualifying paper, dissertation, and subsequent professional career. Students register for this seminar in their last semester of coursework.
- **SWK-S 800 Dissertation Research** (1-12 cr.) Dissertation research.
- **SWK-S 790 Special Topics in Social Work Practice, Theory, and Research Independent Studies** (1-3 cr.) P: Approval by appropriate instructor. This course provides students with an opportunity to engage in focused study of a substantive area of social work practice directly related to the student's identified area of theoretical and research interest. It is completed with the approval and under the guidance of a member of the Ph.D. faculty.
- **SWK-S 805 Select Topics in Social Work** (1-5 cr.) Seminar in areas of social work in which formal courses are not offered and for which advanced study beyond work offered in classes is needed.

Sociology

School of Liberal Arts

Departmental E-mail: sociolog@iu.edu or teamgrad@iu.edu

Departmental URL: [Sociology Academic Programs](#)

Curriculum

Courses

Degrees Offered

Doctoral Minor in Sociology

Program Information

Students who are candidates for the Ph.D. degree in other departments may obtain a minor in Sociology at IU Indianapolis. The intent of the minor is to develop multidisciplinary skills, exposing students to theories and methods outside their major department. The Ph.D. minor in Sociology has an unstructured curriculum that can provide students with a foundation in basic areas in Sociology and the opportunity to study advanced

sociological theory, qualitative and quantitative research methods, and statistics.

Graduate Minor Requirements

- Four Sociology courses at the 500 level or above totaling 12 credits
- An average grade of B (3.0 on a 4.0 scale) or above in these courses
- No more than one individual readings course (SOC-R 697)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **SOC-R 515 Sociology of Health and Illness (3 cr.)** Surveys important areas of medical sociology, focusing on social factors influencing the distribution of disease, help-seeking, and health care. Topics covered include social epidemiology, the health-care professions, socialization of providers, and issues of cost and cost containment.
- **SOC-R 551 Quantitative Methods in Sociology (3 cr.)** Surveys the major quantitative techniques for investigating current sociological problems. It emphasizes the relationship between theory and practice in understanding and conducting research.
- **SOC-R 556 Advanced Sociological Theory I (3 cr.)** In-depth study of classical sociological theorists, particularly Marx, Durkheim, and Weber. Examines their roles in defining the discipline.
- **SOC-R 557 Advanced Sociological Theory II (3 cr.)** In-depth study of contemporary sociological theories (e.g., social conflict, structural functionalist, symbolic interactionist) as a continuation of the issues raised by the classical sociological theorists as well as a response to the epistemological and social changes of the late twentieth century.
- **SOC-R 559 Intermediate Sociological Statistics (3 cr.)** P: R359 or equivalent. Basic techniques for summarizing distributions, measuring interrelationships, controlling extraneous influences, and testing hypotheses are reviewed as students become familiar with the computer system. Complex analytical techniques commonly applied in professional literature are examined in detail, including analysis of variance, path diagrams, factor analysis, and log-linear models.
- **SOC-R 585 Social Aspects of Mental Health and Mental Illness (3 cr.)** This is a graduate-level course that focuses on the sociology of mental illness and mental health. Provides a thorough grounding in the research issues and traditions that have characterized scholarly inquiry into mental illness in the past. Students will become familiar with public policy as it has had an impact on the treatment of mental illness and on the mentally ill them
- **SOC-R 594 Graduate Internship in Sociology (3-6 cr.)** P: 18 hours of graduate credit in sociology. This course involves master's degree students working in organizations where they apply or gain practical insight into sociological concepts, theories, knowledge, and methodology. Students analyze their experiences through work logs, a lengthy written report, and regular meetings with a faculty committee. (Students on the thesis track may also take this course as an elective.)
- **SOC-R 653 Public Opinion: Research and Analysis (3 cr.)** An analysis of the role and operation of public opinion in the decisions and behavior of political elites, and of the effect of governmental elites' activities on public opinion. Major socio-political research and theories will be covered together with practical experience in polling techniques and analysis.
- **SOC-R 697 Individual Readings in Sociology (1-6 cr.)** Investigation of a topic not covered in the regular curriculum that is of special interest to the student and that the student wishes to pursue in greater detail. Available only to sociology graduate students through arrangement with a faculty member.
- **SOC-S 526 The Sociology of Human Sexuality (3 cr.)** P: Graduate standing and consent of the instructor. This is a one-semester graduate-level course in the sociology of human sexuality. This course will provide (a) a detailed examination of the development of sex research, (b) a sociological perspective on and critique of this corpus, and (c) an opportunity for students to develop research of their own.
- **SOC-S 560 Graduate Topics (3 cr.)** Exploration of a topic in sociology not covered by the regular curriculum but of interest to faculty and students in a particular semester. Topics to be announced. Emphasis is placed on the relation between the classic and contemporary literature in the field. Recent topics include "Textual Analyses" and "Health Policy and Politics".
- **SOC-S 616 Sociology of Family Systems (3 cr.)** P: Graduate standing or consent of the instructor. Focus on the nature, structure, functions, and changes of family systems in modern and emerging societies, in comparative and historical perspective. Attention is given to relationships with other societal subsystems, and to interaction between role occupants within and between subsystems.
- **SOC-S 659 Qualitative Methods in Sociology (3 cr.)** Methods of obtaining, evaluating, and analyzing qualitative data in social research. Methods covered include field research procedures, participant observation, interviewing, and audio video recording of social behavior in natural settings.

Rarely or Currently Not Offered Courses

- **SOC-R 517 Sociology of Work (3 cr.)** Must be at graduate standing. Course explores how work is being restructured in the "new economy." Topics include the changing meaning of work, the quest for dignity in the workplace, the plight of the working poor, and prospects for the labor movement (among other items).
- **SOC-R 525 Gender and Work (3 cr.)** P: Graduate standing and 6 credit hours of sociology, or consent of the instructor. This course critically analyzes contemporary theory and research on gender and

work. It examines how women's and men's roles in paid and unpaid work are socially constructed, through socialization, social interaction, and the actions of social institutions. The interaction of gender, race, ethnicity, and social class will be explored.

- **SOC-R 530 Families and Social Policy (3 cr.)**
P: R100, R220, graduate standing. This seminar will explore how the government and labor market affect family structure and the quality of family life. Students will study the implications of family research for social policy and learn to develop theoretical frameworks for evaluating social policies affecting families.
- **SOC-R 537 Gender and Society (3 cr.)** Examines some of the approaches to gender, emphasizing social interactionist and feminist theory/methods. In addition, we will relate these approaches to the study of contemporary gender approaches in selected social spheres, which may vary according to instructor's specialization.
- **SOC-R 593 Applied Fieldwork for Sociologists (3 cr.)** This course will provide students with both a theoretical and methodological background in the different types of qualitative analysis used in sociological fieldwork. Students will have the opportunity to study and to evaluate representative examples of qualitative studies and to complete by themselves a project done with qualitative methods.
- **SOC-R 610 Sociology of Health and Illness Behavior (3 cr.)** This seminar explores sociological and social scientific research on health and illness behavior. Special emphasis is placed on examining how social factors and conditions shape people's responses to disease, illness, and disability.
- **SOC-S 500 Pro-Seminar in Sociology (1 cr.)**
P: Graduate standing and/or consent of the instructor. Introduction to current sociological research interests and concerns through the work of departmental members.
- **SOC-S 530 Introduction to Social Psychology (3 cr.)** P: Graduate standing or consent of the instructor. Examines the broad range of work in social psychology. Emphasis is placed on the relation between the classic and contemporary literature in the field.
- **SOC-S 610 Urban Sociology (3 cr.)** P: Graduate standing or consent of the instructor. Historical and contemporary causes, trends, and patterns of urbanization throughout the world. Various approaches to studying the process of urbanization, including ecological, social organizational, and political perspectives. Current developments and problems in urban planning.
- **SOC-S 612 Political Sociology (3 cr.)** P: Graduate standing or consent of the instructor. An analysis of the nature and operation of power in a political system. Topics may include classical theories of power, political behavior and campaigns, the role of mass media in sustaining power, the state as a social institution, and political movements.
- **SOC-S 613 Complex Organizations (3 cr.)** Theory and research in formal organizations: industry, school, church, hospital, government, military, and university. Problems of bureaucracy and decision-

making in large-scale organizations. For students in the social sciences and professional schools interested in the comparative approach to problems of organization and their management.

- **SOC-S 632 Socialization (3 cr.)** The processes of development of the individual as a social being and societal member, focusing on childhood or socialization into adult roles.

Social and Behavioral Sciences

Richard M. Fairbanks School of Public Health

Program E-mail: fsphinfo@iu.edu

Departmental URL: fairbanks.indianapolis.iu.edu/academics/doctors/minors/sbs

Doctoral Minor in Social and Behavioral Sciences

Discover the Doctoral Minor in Social and Behavioral Sciences

The IU Richard M. Fairbanks School of Public Health offers a PhD minor in social and behavioral sciences that provides students with a foundation in the concepts, principles and practice of the topic.

People who possess these specialized skills are in high demand because of what they can contribute to many doctoral-level research projects.

The doctoral minor in Social and Behavioral Science is a rigorous, highly focused 12-credit hour minor that serves as a useful complement to many major areas of study. You will learn both theoretical concepts and how to apply them. By completing this minor, you will be able to:

- Identify the causes and conditions linked to social, cultural, and behavioral factors that affect the health of individuals and populations
- Use systems methods to analyze the effects of political, social, and economic influences on public health systems at the individual, community, state, national, and international levels
- Identify social, cultural, and behavioral science factors, theories, and models used to develop, implement, and evaluate interventions designed to positively affect health behaviors in populations
- Describe steps and procedures for planning, implementation, and evaluation of public health programs, policies, and interventions
- In collaboration with others, prioritize individual, organizational, community, and societal concerns and resources for public health programs, policies, and interventions
- Apply evidence-based approaches in the development, implementation, and evaluation of social and behavioral science interventions in diverse populations
- Specify targets and levels of intervention for social and behavioral science programs and/or policies

Because you can choose three of the courses from a list of options, you can easily customize this minor to your unique interests and needs. This minor is ideal for students from many schools, including the IU schools of Nursing, Dentistry, Medicine, Exercise Science,

Health Rehabilitative Sciences, Law, and Public and Environmental Affairs.

Students who wish to obtain a doctoral minor from the IU Richard M. Fairbanks School of Public Health must earn a grade of "B" or better in the coursework for the minor. Courses in which a grade of "B-" or lower is earned will not apply toward completion of the minor. Faculty in the department of Social and Behavioral Sciences will serve as advisors for students choosing this minor.

Required Course

- PBHL-P 510: Introduction to Public Health (3 credits)

Plus choose three courses from the following list:

- PBHL-S 617 Health Promotion and Disease Prevention (3 credits)
- PBHL-S 619 Health Disparities and Health Equity (3 credits)
- PBHL-S 620 Biobehavioral Mechanisms of Stress (3 credits)
- PBHL-S 625 Applied Public Health Campaign and Social Marketing Strategies (3 credits)
- PBHL-S 630 Global Maternal and Child Health (3 credits)

Other courses may be taken if approved by the student's minor advisor. Students who have already completed any of the required courses as part of their MPH or PhD requirements may not apply those courses toward their minor in Social and Behavioral Sciences and must instead work with their faculty advisor to identify alternate SBS courses.

The student's minor advisor will monitor satisfactory completion of the requirements for the doctoral minor in Social and Behavioral Sciences. Doctoral students must notify the Fairbanks School of Public Health before beginning their course of study for the minor.

Courses

- **PBHL-P 510: Introduction to Public Health (3 credits):** Students will learn the basic foundations and disciplines of public health. Explore the public health impact where populations live, work and play will be covered. Students will develop tools to examine issues and create solutions through a public health lens.
- **PBHL-S 617 Health Promotion and Disease Prevention (3 credits):** Health promotion and disease prevention are important in improving a nation's health. This course will provide an in-depth analysis of key foundational concepts of health promotion to include: advocacy, health communication strategies, and using evidence and theory to select health promotion programs across settings.
- **PBHL-S 619 Health Disparities and Health Equity (3 credits):** The goal of public health is to promote and protect the health of all people and their communities. This is difficult because individuals and communities have different health concerns and needs. This course will help students identify challenges facing public health and provides students with strategies for overcoming them.

- **PBHL-S 620 Biobehavioral Mechanisms of Stress (3 credits):** his course will examine stress holistically, i.e. from a biological/physiological, psychological and sociological perspective. You will learn how stress is manifested psychologically as well as in the systems of the body. You will also examine stress from a community/population perspective. Finally, the effects of stress on the body will be examined through examples from its role as a cause of and contributor to major illnesses.
- **PBHL-S 625 Applied Public Health Campaign and Social Marketing Strategies (3 credits):** This course will introduce students to the process of developing and evaluating public health campaigns. Students will incorporate various tools and strategies, including social marketing, to promote behavior change. Through individual assignments, group activities, and several guest speakers from the field, students will gain practical experience in the various phases of designing effective public health campaigns.
- **PBHL-S 630 Global Maternal and Child Health (3 credits):** The impact of global maternal and child health (MCH) conditions at different stages of the life cycle, and their functional biopsychosocial outcomes will be explored. Students will explore the different contexts that influence global MCH as well as intervention and policy strategies that optimize MCH.

Translational Cancer Biology

School of Medicine

Departmental URL: cancer.iu.edu/education/graduate-training/phd

Program Contact Indiana BioMedical Gateway Program, biomed@iu.edu

Curriculum

Courses

Degree Offered

Doctor of Philosophy Degree in Translational Cancer Biology
Minor in Translational Cancer Biology

Translational Cancer Biology PhD

Program Description

The Translational Cancer Biology (TCB) PhD Program participates in the Indiana Biomedical Gateway (IBMG) Program. The IBMG Program provides a shared first year experience for all of the School of Medicine biomedical science pre-doctoral (Ph.D. program) students. The link for the IBMG program is: <https://medicine.iu.edu/graduate-degrees/phd/indianapolis>. Eligible faculty mentors are members of the Indiana University Comprehensive Cancer Center (IUSCCC) who are members of the IU Graduate Faculty. Students may arrange to work with a mentor working on a range of cancer biology-related research projects.

Admission Requirements

To be admitted to the Ph.D. minor in Translational Cancer Biology, you must be a currently enrolled doctoral student

in good academic standing in any IU or IU-Indianapolis school.

Program-Level Student Learning Outcomes

Students completing the PhD program in TCB will be able to:

- Identify and conduct original research in cancer, including the translation of basic science into clinical application:
 - Employ rigorous approaches to data collection, replication, and design of experimental controls, as well as the interpretation of data to draw defensible conclusions.
 - Recognize appropriate, and often novel, means of collecting data; working independently or as part of an interdisciplinary team of scientists and physicians.
- Interpret scientific literature and think critically to generate and experimentally test hypotheses to solve problems related to cancer biology.
- Effectively communicate findings of their own research as well as in the general area of cancer biology to their peers and the general public through oral presentation and contribution to the scientific literature. This includes ability to write a scientific proposal to solicit research funding.
- Conduct research in an ethical and responsible manner.

Degree Requirements

The TCB degree will require a minimum of 30 hours of coursework credit; the majority of which will be in the form of didactic classroom lectures and research seminars. Of these 30 credits, 18 apply towards the major area and 12 towards the minor. The remaining credits will be in the form of laboratory research credits (45-60 credits) that will be supervised by a Graduate Faculty mentor and an advisory/research committee selected by the student. Additional coursework may be approved by the student's advisory committee (up to a maximum of 15 hours). The program is designed to be completed in approximately 4.5-5 years.

A minimum of 18 credit hours of major area coursework will be required, including the following:

Required Major Core Courses (at least 12 credits)

Students will complete all of the following:

- GRDM-G 724: Molecular Cancer Genetics (1 cr)
- GRDM-G 852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr)
- CANB-C 850 Integrated Training in Cancer Symptom Science (2 cr)
- CANB-C 851 Cancer Genomics, Metabolomics and Targeted Therapy (2 cr)
- GRDM-G 507: Reagent Validation as a Mean for Enhanced Research (1 cr)
- GRDM-G 855: Experimental Biostatistics (1 cr)
- Responsible Conduct of Research Requirement - Students will complete one of the following:
 - GRDM-G 504: Introduction to Research Ethics (2-3 cr.)
 - GRDM-G 505: Responsible Conduct of Research (1 cr.)
 - GRDM-G 506: Responsible Conduct of Translational and Clinical Research (1 cr)

- Science Communication requirement - Students will complete one of the following:
 - COMM-C 534: Distilling Your Message (1 cr)
 - COMM-C 533: Improvisation for Scientists (1 cr)
 - ENG-W 533: Science Writing (1 cr)
- Grant writing requirement – students will complete one of the following:
 - CANB-C 854 - Writing Grant Proposals and Abstracts for Translational Cancer Biology (1 cr)
 - BIOC-B 803 – Advanced Biochemistry (1 cr)

Elective courses (at least 6 credits*):

- CANB-C 853 Clinical Cancer Care (1 cr)
- GRDM-G 700: Translating Foundational Science to Contemporary Knowledge
- GRDM-G 702 Entering Biomedical Research (1 cr)
- GRDM-G 715 Biomedical Science I (2 cr)
- GRDM-G 716 Biomedical Science II (2 cr)
- GRDM-G 717 Biomedical Science III (2 cr)
- GRDM-G 720 Stem Cell Biology (2 cr)
- GRDM-G 725 Gene Therapy (1 cr)
- GRDM-G 727 Animal Models of Human Disease (1 cr)
- GRDM-G 729 Immunology I-Intro to the Immune System (1 cr)
- GRDM-G 737 Introduction to Histology (1-4 cr)
- GRDM-G 740 Translational Systems Physio and Pharm (1 cr)
- GRDM-G 745 Fundamentals of Intracellular Signal Transduction (1-2 cr)
- GRDM-G 747 Principles of Pharmacology (1 cr)
- GRDM-G 748 Principles of Toxicology (1 cr)
- GRDM-G 749 Introduction to Structural Biology (1 cr)
- GRDM-G 817 Molecular Basis of Cell Structure and Function (2 cr)
- GRDM-G 848 Bioinformatics, Genomics, Proteomics and Systems Biology (2 cr)
- MICR-J 807 Current Topics in Immunology (2 cr.)
- MICR-J 829 Current Topics in Molecular Genetics of Microorganisms (2 cr)
- MGEN-Q 620 Human Cytogenetics (3 cr)
- Other courses may be used as an elective with the approval of the program advisor and the student's advisory committee

*6 credit minimum elective must be earned, student may select more elective course credits, but at least 45 credits must be research. Students must score at least B– on each course and maintain at least a B average (3.0 minimal GPA) in all non-research course work.

Research Courses (45-60 credits)

- CANB-C860, Research in Translational Cancer Biology (45-60 cr)

- GRDM-G803, Mentored Research for MD/PhD students (up to 9 credits may be applied)
- GRDM-G718 can be applied to the overall total of research courses.
IBMG Students take 6 cr of GRDM-G718: Laboratory Research Rotation (3 rotations of 8 weeks, 2 cr each).

Minor

Students will select a minor consisting of 12 credit hours in a related field.

These credits must be in lecture or laboratory courses other than research and must meet the requirements of the department in which the minor is taken. For the life sciences minor, a minimum of 6 credit hours must be obtained in one department.

Qualifying Examination

Within the first two years following entry into the Translational Cancer Biology PhD program, the student will submit a written research proposal in the form of an NIH F31 predoctoral-style grant application to their advisory committee. The student will then defend this proposal during an oral examination administered by the advisory committee. Passing of this defense is required for advancement to doctoral candidacy. The qualifying exam must be completed by the end of spring semester of year 3. Upon advancement to candidacy, a thesis research committee is formed that may consist of different faculty

Doctoral studies are continued if the qualifying examination and other work, including research, are deemed satisfactory by the majority of the research committee.

Final Examination

Oral defense of the written dissertation.

Other Requirements

It is expected that the student's dissertation research will be of sufficient quality to be published in a primary peer-reviewed journal appropriate for the student's research area.

It is the policy of the Translational Cancer Biology PhD program that all the requirements of the PhD degree program must be completed, and the final, approved dissertation thesis deposited with the University Graduate School within 5 years of the date of passing the Qualifying Examination. Failure to complete the degree within 5 years of passing the Qualifying Examination will result in dismissal from the program.

Translational Cancer Biology Minor

PhD Minor in Translational Cancer Biology

Translational cancer biology minor is to provide breadth and depth of cancer knowledge to graduate students. This minor consists of courses outside of the major department. This interdisciplinary minor is offered through IU Simon Comprehensive Cancer Center.

Plan of Study (12 credit hours total)

Required Core Courses in Translational Cancer Biology

Complete two out of three of the courses below:

- GRDM-G852: Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)
- CANB-C850: Integrated Training in Cancer Symptom Science (2 cr)
- CANB-C851: Cancer Genomics, Metabolomics and Targeted Therapy (2 cr)

Required Elective Courses

The remainder of the courses will be selected from the following:

- CANB-C853: Clinical Cancer Care (1 Cr.)
- GRDM-G700: Translating Foundational Science to Contemporary Knowledge (1 cr.)
- GRDM-G715: Biomedical Science I–Biochemical Basis of Biological Processes (2 cr.)
- GRDM-G716: Biomedical Science II–Molecular Biology and Genetics (2 cr.)
- GRDM-G717: Biomedical Science III–Cellular Basis of Systems Biology (2 cr.)
- GRDM-G720: Stem Cell Biology (2 cr.)
- GRDM-G724: Molecular Cancer Genetics (1 cr.)
- GRDM-G737: Introduction to Histology or ANAT-D851: Histology (1-4 cr.)
- GRDM-G748: Principles of Toxicology 1 (1 cr.)
- GRDM-G749: Introduction to Structural Biology (1 cr.)
- GRDM-G807: Structural and Chemical Biology (2 cr.)
- GRDM-G817: Molecular Basis of Cell Structure and Function (2 cr.)
- GRDM-G848: Bioinformatics, Genomics, Proteomics, and Systems Biology (2 cr.)
- GRDM-G727: Animal Models of Human Disease; Medical and Molecular Genetics (1 cr.)
- MGEN-Q620: Human Cytogenetics (3 cr.)
- MICR-J807: Current Topics in Immunology (2 cr.)
- MICR-J829: Current Topics in Molecular Genetics of Microorganisms (2 cr.)

Minor Program Notes

The minor program will be approved by the student's advisory committee which will take into consideration the student's total didactic experience. The advisory committee may approve additional and/or substitution of appropriate courses to complete the degree requirements. The minor representative on this Committee will be selected from outside the student's major program.

Qualifying Exam

This Ph.D minor does not require a Qualifying Exam. Students will form an Advisory Committee upon acceptance into the TCB PhD Program.

NOTE: Courses cannot count towards both the students PhD major and PhD minor. Work with your major and minor advisors to find appropriate substitutes if courses overlap between the major and the minor

Grading Policy

A minimum of B (3.0) is required in each course that is to count toward the minor. If a minimum of B (3.0) is not earned in a course, that course must be retaken. A course

may be retaken only once. Students who fail to achieve the minimum grade of B (3.0) the second time they take a course, will not be able to earn this Ph.D. minor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

- **GRDM G852 Concepts of Cancer Biology: Signaling Gone Awry (2 cr.)** Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival, and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment. Quilliam and Nakshatri.

CANB C850 Integrated Training in Cancer Symptom Science (2 cr.) The course will provide students with extensive knowledge on the physiological, molecular and biochemical abnormalities accompanying muscle, bone and neuronal derangements that occur in cancer or following anticancer treatments. Fehrenbacher and Sankar.

CANB C851 Cancer Genomics, Metabolomics and Targeted Therapy (2 cr.) Basic principles of genomics and metabolomics with an emphasis on their applications to cancer. In addition to the methodological details, the lectures will focus on new discoveries and insights gained from these approaches that are leading to therapeutic interventions in cancer. O'Connell and Ivan.

CANB-C860 Research in Translational Cancer Biology (variable cr, hours arranged), Requires consent of the Graduate Director. This course is the academic component of laboratory-based research that a student in the Translational Cancer Biology program engages in while a student in the program. This course addressed both research conducted in a lab prior to the start of a thesis/dissertation project, and the thesis/dissertation project itself.

CANB-C853 Clinical Cancer Care (1 cr.)- The goal of this physician-taught course is to have an open and dynamic discussion of the real human impact of translating discoveries from research laboratories to clinical practice. This course will introduce cancer biology students to the entire spectrum of clinical cancer care, ranging from screening to diagnosis to treatments. Quilliam, Nayak.

CANB-C854 Scientific Writing and Communication (1 cr.)- The goal of this course is to provide an introduction to effective scientific writing required both for completion of the PhD qualifying exam and for a continued successful career in translational cancer research. Students will also learn tips in presenting their cancer research in oral and poster formats as well as communicating with a non-scientific "lay" audience.

BIOC-B 803 ADVANCED BIOCHEMISTRY (1-3 cr.)

CANB-C 850 Integrated Cancer Symptom Science (2 cr): This team-taught didactic course

will be taught in a disease-based manner by experts across muscle, bone, and neuronal disciplines to create a more complete understanding cancer symptoms in the context of the physiology of the skeletal muscle, bone, and nervous system.

CANB-C 851 Cancer Genomics, Metabolomics and Targeted Therapy (2 cr): This course is designed to teach the students the basic principles of genomics and metabolomics related on their applications to cancer. In addition to the methodological details, the lectures will focus on new discoveries and insights gained from these approaches that are leading to therapeutic interventions in cancer.

CANB-C 853 Clinical Cancer Care (1 cr): This physician-taught course will provide an open and dynamic discussion of the human impact of translating discoveries from cancer research laboratories to clinical practice. It will introduce cancer biology research graduate students to the spectrum of clinical cancer care, including screening, diagnosis, and treatments to identify areas of unmet need.

CANB-C 854 Written Grant Proposals and Abstracts for Translational Cancer Biology (1 cr): The goal of this course is to provide an introduction to effective scientific writing required for the PhD qualifying exam and for a successful career in translational cancer research. Students will learn tips in presenting their cancer research in oral and poster formats and communicating with a non-scientific "lay" audience.

CANB-C 860 Research in Translational Cancer Biology (1-10 cr): This course is the academic component of laboratory-based research that a student in the Translational Cancer Biology program engages in while a student in the program. This course addressed both research conducted in a lab prior to the start of a thesis/dissertation project, and the thesis/dissertation project itself.

COMM-C 533 Improvisation for Scientists (1 cr): Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 Distilling Your Message (1 cr): Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

ENG-W 533 Science Writing (1 cr): With an emphasis on shorter forms of writing, students discover voices, messages, and forms appropriate for bringing scientific expertise to non-science readers. They practice processes of response, revision, and editing to shape presentations for various readers, contexts, and paths of publication.

GRDM-G 504 Intro to Research Ethics (1-3 cr): Introduction to the basic concepts of research ethics. The course will cover the historical development of concern with ethics in science as well as practical information needed by students working in science today. Format will be lecture and discussion.

GRDM-G 505 Responsible Conduct of Research (1 cr): An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.

GRDM-G 506 Responsible Conduct of Translational Research (1-2 cr): This course provides an introduction to the responsible conduct of research (RCR), which the NIH defines as follows, "the practice of scientific investigation with integrity. It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research." While RCR is required for all types of research, this course focuses on issues that arise in relation to clinical and translational research, mostly involving human subjects. Completion of this course fulfills the NIH requirements for instruction in RCR for trainees and students.

GRDM-G 507 Reagent Validation as a Means for Enhanced Research Reproducibility (1 cr): "Reagent Validation as a Means for Enhanced Research Reproducibility" is designed to provide training for pre-doctoral students in the area of appropriate reagent utilization by focusing on biological variables, with particular attention to murine models, and on biological and chemical resources, with particular attention to cell line authentication, plasmid verification, and antibody utilization. This course will entail a traditional didactic lecture series accompanied by relevant whole-class practical exercises allowing students to implement basic methods of reagent verification.

GRDM-G 700 Translating Foundational Science to Contemporary Knowledge (1 cr): G700 is designed to complement the learning of the foundational principles in biomedical sciences in courses G715, G716, and G717, in the form of a 1 credit, once per week class session. Faculty will guide the students through a background discussion of the assigned topic, and then through discussion of an assigned paper from the primary literature.

GRDM-G 702 Entering Biomedical Research (1 cr): This mentee training curriculum is designed for first year graduate students to get the most from their mentored research experience. Group activities, case studies and facilitated discussion, are used to cover topics and concepts organized to develop their research skills, interpersonal skills, psychosocial skills, professionalism skills, and group dynamic skills.

GRDM-G 709 Foundations of Stem Cells in Physiology, Pathophysiology, and Clinical Utilization (1 cr): This course is designed to introduce learners to the foundational concepts of the types, language, techniques, biology and clinical applications of all types of stem cells from

embryonic to somatic. Students will practice reading the stem cell literature and is meant to complement the concepts learned in the first year.

GRDM-G 715 Biomedical Science I (2 cr): One of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Covers molecular and metabolic aspects of cellular function.

The course will explore topics in the biochemical basis of biological systems, including biological macromolecules, protein ligand interactions, cell-signaling, and metabolic processes.

GRDM-G 716 Biomedical Science II (2 cr): Second of three biomedical science courses intended for incoming doctoral graduate students in the School of Medicine or other graduate students. Topics covered include DNA structure and replication, recombination and repair, genomics and processes of inheritance, gene expression, eukaryotic systems, and molecular genetics and disease.

GRDM-G 717 Biomedical Science III (2 cr): Third of a group of three biomedical science core courses intended for incoming doctoral graduate students in School of Medicine programs or other graduate students. Organization and function of cells, tissues and physiologic systems using disease examples.

Topics include neurophysiology, musculoskeletal, renal, cardiovascular, gastrointestinal, endocrine and pulmonary systems, and cancer.

GRDM-G 720 Stem Cell Biology (2 cr): This course will cover the self-renewal, proliferative, survival, differentiation, and migration/homing characteristics of hematopoietic and embryonic stem cells, how these functions are regulated by cytokines/chemokines and other external other external stimuli, and what their clinical capabilities are and might be.

GRDM-G 724 Molecular Cancer Genetics (1 cr): An introduction to cancer focusing on genetics. Topics include causes and effects of chromosome instability (including centromere/telomere failures and chromosomal translocation), epigenetic changes and genetic risk factors during cancer progression.

GRDM-G 725 Gene Transfer Approaches (1 cr): A lecture-based course of basic principles involved with the transfer and expression of genetic material. Focus on technical aspects of each vector system, followed by applications to human diseases/experimental animal models. Practical understanding of non-viral and viral gene transfer to utilize these techniques in research studies.

GRDM-G 727 Animal Models of Human Disease (1 cr): This class explores advantages and limitations of animal models of human disease. Topics include models for diabetes, psychiatric disorders, cancer, osteoporosis, polycystic kidney and cardiovascular disease. The goal of the course is to provide a framework for students to select experimental animal models in their future research careers.

GRDM-G 729 Immunology I-Introduction to the Immune System (1 cr): An introductory biomedical science, lecture-based core course intended for all incoming basic science graduate doctoral students in the School of Medicine programs or other interested graduate students. The course will cover components of the immune system development of the immune system, the immune response to pathogens and immunological disease.

GRDM-G 737 Introduction to Histology (1 cr): This course is designed to introduce graduate students in the biomedical sciences to the microscopic structure of the tissues and organs of the body. It is the first unit of ANAT-D 851 Histology.

Lectures will focus on the structural basis of normal physiology processes, with emphasis of the contribution of the basic tissues (epithelium, nerve, muscle, connective tissue) to simple organ systems (i.e. blood vessels and integument).

GRDM-G 740 Translational Systems Physiology and Pharmacology (2 cr): This course is designed to teach students the basics of physiological systems and therapeutics used to target those systems for the management of known human diseases.

GRDM-G 745 Fundamentals of Intracellular Signal Transduction (1-2 cr): Experimental basis for cellular and molecular concepts of intracellular signaling cascades activated by multiple processes. The goals are to foster an understanding of how we accumulate information and to provide students with tools to evaluate hypotheses and to define unanswered questions, rather than provide "facts" to memorize.

GRDM-G 747 Principles of Pharmacology (1 cr): This course is intended for incoming, basic science doctoral graduate students in the School of Medicine Pharmacology & Toxicology programs of other interested graduate students. This course covers the basic of drug receptor interactions, drug metabolism, pharmacokinetics, and pharmacokinetics. This course will include PowerPoint presentations and student presentations.

GRDM-G 748 Principles of Toxicology 1 (1 cr): This course will present the fundamental concepts of toxicology necessary to understand the effects of chemicals on human health. Cellular and molecular mechanisms involved in toxic responses elicited by pharmaceutical and environmental agents, activation and detoxification of drugs and chemicals, and the principles of carcinogenesis and mutagenesis will be presented.

GRDM-G 749 Intro to Structural Biology (1 cr): An introduction to structural biology including the fundamentals of macromolecular structure and interactions, methods used to determine three-dimensional structures, the relationship between protein sequence and structure, and prediction and analysis of macromolecular structure.

GRDM-G 803 Research (1-4 cr): Mentored research for MD/PhD students.

GRDM-G 807 Structural & Chemical Biology (2 cr): Fundamentals of structural and chemical biology focused on state-of-the art approaches to inhibitor discovery, use of inhibitor in elucidating biological function, and computational and structural approaches to rational inhibitor design.

GRDM-G 817 Molecular Basis of Cell Structure and Function (2 cr): Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.

GRDM-G 848 Bioinformatics, Genomics, Proteomics & Systems Biology (2 cr): Biology has been transformed by various high-throughput technologies (genomics, proteomics, metabolomics, etc.), which in turn have led to a large number of massive databases and software analysis packages. This course focuses on the "omics" technologies, on the resulting databases, and on the computational tools used to analyze the data.

GRDM-G 852 Concepts of Cancer Signaling Gone Awry (2 cr): Fundamentals of cancer biology; the signaling of events that regulate cell growth, survival and differentiation; how mutation/dysregulation of signaling molecules leads to cancer and might be exploited for treatment.

GRDM-G 855 Experimental Design & Research Biostatistics (1 cr): This course is an introduction to proper experimental design and appropriate statistical analysis of data in biological studies, and will equip students to recognize errors that are common in biological experiments and to discern situations in which they should seek help for these issues in their own work.

MGEN-Q 620 Human Cytogenetics (3 cr): Study of chromosome structure and replication, X-inactivation, meiosis, numerical and structural rearrangements in man and cytogenetics of malignancies.

MICR-J 807 Current Topics in Immunology (2 cr): Discussion and review of current literature in selected topics in immunology. Emphasis on molecular and cellular events in lymphocyte activation and regulation. Topic varies from year to year.

MICR-J 829 Current Topics in Molecular Genetics Microorganisms (2 cr): In-depth study of a specific topic in contemporary molecular genetics of microorganisms. Topics vary.

Women's, Gender, and Sexuality Studies

School of Liberal Arts

Departmental E-mail: rtezanos@iu.edu or teamgrad@iu.edu

Departmental URL: liberalarts.indianapolis.iu.edu/academics/degrees-programs/womens-gender-sexuality-studies/index.html

Curriculum

Degrees Offered

Doctoral Minor in Women's, Gender, and Sexuality Studies

Program Information

The Ph.D. minor in Women's, Gender, and Sexuality Studies gives students the chance to broaden their scholarship through an interdisciplinary lens that deepens and expands their graduate research. A student whose work touches on culture, identity, power, institutions, or human experience will find this doctoral minor offers a meaningful way to enrich their perspective and strengthen their academic voice.

Students will explore a wide range of issues related to women, gender, and sexuality and examine how these forces shape society. Courses encourage students to think across disciplines, engage with contemporary research, and connect theory to the questions driving their own work. Students will study with faculty from multiple fields who bring diverse expertise to the classroom, giving them fresh entry points for interpreting and analyzing complex social and cultural dynamics.

This minor is especially valuable for the doctoral student wanting to expand their methodological toolkit, incorporate gender focused analysis into their dissertation, or position themselves for careers that value interdisciplinary thinking. Whether a student is headed toward academia, policy work, healthcare, communication, community leadership, or another professional path, the WGSS Ph.D. minor will help build a richer, more nuanced foundation for research and teaching.

Ph.D. Minor Requirements

The Ph.D. Minor in Women's, Gender, and Sexuality Studies is 12 credits to be chosen from the following courses. All courses must be completed with a minimum grade of C:

WOST-W or WGSS-W 601 Survey of Contemporary Research in Women's, Gender, and Sexuality Studies: The Social and Behavioral Sciences (3 cr.)

WOST-W or WGSS-W 602 Contemporary Research in Women's, Gender, and Sexuality Studies: The Humanities (3 cr.)

WOST-W or WGSS-W 695 Graduate Readings/Research in Women's Studies (3-6 cr.)

WOST-W or WGSS-W 701 Graduate Topics in Women's, Gender, and Sexuality Studies (3-4 cr.)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

- **WGSS-W 601 Survey of Contemporary Research in Women's, Gender, and Sexuality Studies: The Social and Behavioral Sciences (3 cr.)** n exploration of feminist perspectives in the social sciences. Theoretical frameworks and research styles used by feminist social scientists are

examined, as are feminist critiques of traditional social scientific frameworks and research methods. Research reports by feminist researchers in social scientific disciplines are also read and analyzed.

- **WGSS-W 602 Contemporary Research in Women's, Gender, and Sexuality Studies: The Humanities (3 cr.)** Review of literature on sex roles, psychology of women, socialization, and politicization of women. Training in methodology of research on women; critique of prevailing and feminist theoretical frameworks for studying women.
- **WGSS-W 695 Graduate Readings/Research in Women's, Gender, and Sexuality Studies (3-6 cr.)** An opportunity for graduate students to explore specific issues within the field of Women's, Gender, and Sexuality Studies, guided by faculty with particular expertise in these areas. The course is used to do readings and research that go beyond what is covered in other Women's, Gender, and Sexuality Studies graduate courses offered on this campus. It also involves faculty not normally involved in the teaching of these other courses but who have skills and knowledge relevant to the issues being investigated.
- **WGSS-W 701 Graduate Topics in Women's, Gender, and Sexuality Studies (3-4 cr.)** Advanced investigation of selected research topics in Women's, Gender, and Sexuality Studies. Topics to be announced.

Biomedical Science Teaching & Learning

School of Medicine

Departmental E-mail: gradiusm@iu.edu

Departmental URL: medicine.iu.edu/graduate-degrees/phd/indianapolis

Curriculum

Description

This interdisciplinary minor is designed to provide PhD students engaged in basic and translational biomedical research and associated studies an essential foundation related to teaching, curriculum, and pedagogy with a focus on inclusive teaching rooted in practices of scientific research.

Program Learning Outcomes

At the end of the PhD minor, students will be able to:

1. Design an instructional unit (course, module) independently for use in a course or lesson while teaching in a biological/biomedical sciences context
2. Describe and apply fundamental concepts related to teaching, learning, assessment, teaching all learners, and integrating technological advancements into teaching in a meaningful way
3. Analyze curricular, learning, and sociocultural theories to better facilitate student learning in life science teaching and learning settings in a college/university context
4. Design individual learning experiences in academic settings

5. Create and Implement learning experiences independently and under mentorship for university students in life science disciplines

Doctoral Minor Program of Study

1. Required Course(s)

- GRDM-T721 (EDUC-T721): Teaching and Learning in the Biomedical/Life Sciences (3 cr)
- 2. Supervised Teaching Experiences in the Biomedical/Life Sciences
- GRDM-T751: Teaching and Curricular Assistant Experience in Biomedical Science (1 cr)
 - An initial experience in teaching and learning, typically requiring 5-8 hours per week during the experience. This experience must be completed prior to GRDM-T752 and will be arranged in consultation with your minor advisor.
- GRDM-T752: Supervised Co-Teaching in Biomedical Sciences (2 credits); prerequisite: GRDM-T721
 - A second-level experience in teaching and learning, in which the student expected to teach class sessions multiple times and participate in the operation of a course in a training capacity in collaboration with the course director. Expected time engaged in teaching per week to be 8-15 hours per week maximum during the experience. The hours per week depend on if the schedule is over a semester or condensed into a shorter term. This experience will be arranged in consultation with your minor advisor and your advisory committee.

3. Possible electives

Choose courses from the following list, or others approved by your minor advisor to reach a minimum of six (6) credit hours.

IU Indianapolis School of Education Options:

- EDUC-J500: Instruction in the Context of Curriculum (3 cr.)
- EDUC-P540: Learning and Cognition in Education (3 cr.)
- EDUC-T701: Introduction to Critical Race Theory (3 cr.)
- EDUC-P507: Assessment in Schools (3 cr.)
- EDUC-W531: Teaching, Learning and Technology (3 cr.)
- EDUC-W550: Current Technology Trends (3 cr.)
- MICR-J710: Practical Training in Teaching Clinical Microbiology and Immunology (1 cr)
- ANAT-D878: Anatomy Teaching Practicum (2 credits)

IU Bloomington Options:

Note that taking courses offered at the IU Bloomington campus (or any other IU campus) may result in increased tuition and fees. Students should not register for these courses without consulting with their minor advisor and

advisory committee to determine that an IUPUI option does not provide the same opportunity.

- MSCI-M620: Pedagogical Methods in the Health Sciences (3 cr.)
- EDUC-C750: Special Topics in Higher Education - Learning & Teaching on the College Campus
- EDUC-C750: Special Topics in Higher Education - Curriculum in Higher Education
- EDUC-C750: Special Topics in Higher Education - Scholarship of Teaching and Learning

Other courses as approved by the student's Minor Advisor and Advisory Committee can be used as electives.

Relationship of PhD Programs and Minors

Courses taken as part of a doctoral minor cannot be applied to both a major and a minor. Please consult with your minor advisor about any potential overlap and how to address any potential overlaps at the time of or before selecting this minor.

Assessment of Student Learning

The supervised teaching experience will serve as a capstone experience for the minor. The student is expected to complete the capstone experience near the end of their minor. Additionally, the student should be in communication with their minor advisor about their progress.

The student and their minor advisor should consult with the student's PhD program/department providing the major as to whether this minor is to be included in the qualifying examination and by when courses for this minor should be completed if included in and required for the qualifying exam.

Proposed Scheduling of Courses for the Minor

- GRDM-T721: Fall semester of second year of an IUSM PhD Program (offered every fall)
- GRDM-T751: Any semester beginning in the fall of the second year of an IUSM PhD Program (offered every fall, spring, and summer semester)
- GRDM-T752: Completed after GRDM-T751, during the spring semester of the second year, summer of the second year, or at the latest the fall of the third year (offered every fall, spring, and summer semester)
- Electives: Any time from summer of the first year through the fall of the third year (at the latest), and taking these during the second year is preferred (offered at various intervals; determined by sponsoring program/department/school)

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

ANAT-D 878: Anatomy Teaching Practicum (2 credits)

This course is designed to provide each student with supervised teaching experiences in Gross Anatomy, Histology, and Neuroscience, as well as critical reviews of all teaching duties.

GRDM-T 721 (EDUC-T721): Teaching and Learning in the Biomedical/Life Sciences (3 cr): Students examine, apply, and evaluate theories and practices related to teaching in the biomedical sciences. Sessions include discussions of the research literature in the life sciences and allows students to examine teaching and learning practices through a variety of theoretical, strategic, and sociocultural lenses at the university level.

GRDM-T 751: Teaching and Curricular Assistant Experience in Biomedical Science (1 cr): This course is designed to be an initial experience in assisting with the operation and instruction in a life science course. The student will work with one or more course directors, assisting in activities appropriate to their experience and academic credentials, engaging both student support and co-facilitating learning when appropriate.

GRDM-T 752: Supervised Co-Teaching in Biomedical Sciences (2 credits); prerequisite: GRDM-T721: This course is designed to be a capstone experience in the Biomedical Science Teaching PhD minor, though it may be taken independent of that program. Through this course students will develop their knowledge, skills, and abilities as an educator-scientist by actively co-teaching with a teaching mentor in an existing course.

EDUC-J 500: Instruction in the Context of Curriculum (3 cr.): First course for the Master's degree in Curriculum & Instruction. Extends concepts introduced in undergraduate teacher preparation. Topics include conceptions and definitions of curriculum and instruction and their impact on social contexts, learning theories, and schooling practices. Elementary and secondary contexts are studied.

EDUC-P 507: Assessment in Schools (3 cr.): Introductory assessment course for teachers and school administrators. Topics include principles of assessment, formal and informal classroom assessment instruments and methods, formative and summative assessment, interpretation and use of standardized test results, social and political issues in assessment, use of student data bases in schools.

EDUC-P 540: Learning and Cognition in Education (3 cr.): Survey of theoretical positions in the areas of learning and cognition, with emphasis on their relevance for the design of classroom learning situation.

EDUC-T 701: Introduction to Critical Race Theory (3 cr.): This graduate seminar will explore the foundations and central tenets of Critical Race Theory. The course will also examine the sister CRITs and part of an overall analysis of CRT as a framework and a methodology.

EDUC-W 531: Teaching, Learning and Technology (3 cr.): A survey of technology used for teaching and learning which explores technologies in learning environments. Students will critically examine topics such as 21st century learning, new literacies, digital divides, digital citizens, technology in classrooms, web-based tools, mobile technologies, game-based learning, and technology innovations. Students will evaluate educational technology tools and engage in social networking and collaborative learning.

EDUC-W 550: Current Technology Trends (3 cr.): This course investigates innovations, emerging technologies,

and technology's role in education reform. Students will collaborate to search out, evaluate, and synthesize research studies and verifiable information about promising educational technologies. They will present their findings in a webinar for other professionals.

MICR-J 710: Practical Training in Teaching Clinical Microbiology and Immunology (1 cr): This course provides practical training in teaching the fundamentals and clinical applications of microbiology and immunology for nursing and other health pre-professional students.

Students will be introduced to educational concepts, including curriculum design and delivery, and will receive hands-on experience teaching undergraduate-level microbiology and immunology with clinical applications.

Offered through IU Bloomington

MSCI-M 620: Pedagogical Methods in the Health Sciences (3 cr.): For biomedical science graduate students who want to be excellent instructors and classroom researchers. Students will learn about pedagogical methods, student learning styles, and methods of instructional delivery. Students also will learn about the scholarship of teaching and develop a foundation for implementing classroom research and assessment.

EDUC-C 750: Special Topics in Higher Education - Learning & Teaching on the College Campus (1-6 cr.)

EDUC-C 750: Special Topics in Higher Education - Curriculum in Higher Education (1-6 cr.)

EDUC-C 750: Special Topics in Higher Education - Scholarship of Teaching and Learning (1-6 cr.)

Communicating Science

School of Liberal Arts

Departmental email: commdept@iu.edu or teamgrad@iu.edu

Departmental URL:

Curriculum

Courses

Degrees Offered

Graduate Minor in Communicating Science

Program Information

The Graduate Minor in Communicating Science is designed for master's and doctoral students in the sciences and health professions and focuses on developing audience-centered communication, distilling scientific concepts into meaningful narratives, and connecting effectively with collaborators and funders. Students will study communication and rhetorical theory combined with the techniques of applied improvisation to enhance their career prospects, help them secure funding, and teach them to serve as effective teachers.

The Communicating Science Graduate Minor is not open to Health Communication Ph.D. students or Applied Communication M.A. students. All graduate courses taken online must be taught by an IU Indianapolis faculty

member. All courses must be completed with a grade of B or higher.

Graduate Minor Requirements

Each student must take 12 credit hours: 3 credit hours from Co-Requisite Block 1, 3 credit hours from Co-Requisite Block 2, and 6 credit hours of electives.

- COMM-C 534 Distilling Your Message: Communicating Science (1 cr.)
- COMM-C 533 Improvisation for Scientists: Communicating Science (1 cr.)
- ENG-W 533 Science Writing for Public Readers: Communicating Science (1 cr.)
- COMM-C 535 Using Electronic Media: Communicating Science (1 cr.)
- ENG-W 535 Science Writing for Public Readers II: Communicating Science (1 cr.)
- COMM-C 536 Connecting with the Community: Communicating Science (1 cr.)
- COMM-C 510 Health Provider-Consumer Communication (3 cr.)
- COMM-C 521 Family Communication in Health Contexts (3 cr.)
- COMM-C 591 Topics in Applied Comm with relevant topics in science/health (3 cr.)
 - Take with one of these topics: Communication and Mental Health, E-Health Communications, Health Comm Dissemination, Health Communication and Media, International Health Communication, or Metaphors of Health and Illness
- COMM-C 592 Advanced Health Communication (3 cr.)
- COMM-C 650 Health Communication in Mediated Contexts (3 cr.)
- COMM-C 695 Seminar in Communication and Healthcare (3 cr.)
- ENG-G 513 Academic Writing for Graduate Students (3 cr.)
- ENG-G 520 Communication Skills for Graduate Students and Internationals (3 cr.)
- ENG-W 600 Topics Rhetoric and Composition with relevant topics in science/health (3 cr.)
- HIST-H 546 History of Science, Medicine, and Technology (3 cr.)
- JOUR-J 528 Public Relations Management (3 cr.)
- JOUR-J 560 Public Relations Research and Evaluation with topics in Public Relations in the Life Sciences and Integrating Marketing Communication in Health Care (3 cr.)
- PBHL-H 612 Marketing for Health Services Delivery (3 cr.)
- PBHL-S 625 Applied Public Health Campaigns and Social Marketing Strategies (3 cr.)
- PBHL-S 622 Coaching for Health Behavior Change (3 cr.)
- PBHL-E 606 Grant Writing: From Befuddlement to Brilliance (3 cr.)

Other courses from ANTH, COMM, ENG, HIST, JOUR, MHHS, and PBHL in consultation with the program advisor.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Descriptions

COMM-C#510 Health Provider-Consumer

Communication (3) Designed to teach communication skills and practices related to health care talk by examining transactional communication within health care contexts. Topics covered in this course focus directly upon interpersonal dialogue between health care providers and patients.

COMM-C#521 Family Comm in Health Contexts (3)

This interdisciplinary seminar focuses on communication involving families in health care settings, addressing significant issues for graduate/professional students who will work with families, including students in Comm. Studies, Nursing, Psychology, Social Work, Public Health, and Medicine. Topics include communication with families about health care concerns and family-patient-health provider systems.

COMM-C 533 Improvisation for Scientists (1 cr.)

Students will learn to communicate effectively and responsively through a series of exercises drawn from the methods of improvisational theater. Students will practice connecting to an audience, paying dynamic attention to others, reading nonverbal cues, and responding appropriately.

COMM-C 534 Distilling Your Message (1 cr.) Students learn to communicate clearly and vividly about complex scientific research and why it matters, in terms non-scientists can understand. Students practice finding common ground with lay audiences and adjusting levels of message complexity for different audiences.

COMM-C 535 Advanced Science and Research

Communication (3 cr.) Students will explore the social construction of expertise and discuss how rhetorical and narrative theory informs communication. Via community-based projects, students will collate, synthesize, and translate scientific evidence into information that non-expert audiences (such as policy makers, granting organizations, and the lay public) can access, understand, and act on.

COMM-C 536 Connecting with the Community (1 cr.)

Students will theorize and develop techniques for shared meaning-making with community partners. They test methods to develop common ground between experts and community members including the lay public and policy makers. Activities focus on developing trust, open communication, and sharing expertise that values and respects lived experiences of community members.

COMM-C#591 Topics/Seminar in Applied

Communication (3# cr.) This is a revolving topics course. The changing nature of the topic allows graduate students to explore, synthesize, and integrate knowledge of the field of communication and the particular discipline of

applied communication while focusing on a single topic not otherwise addressed in the course of study.

COMM-C#592 Advanced Health Communication (3 cr.) A course designed to teach communication skills and practices related to health care by examining health care communication theory. Topics range across communication levels (interpersonal, intrapersonal, group, organization, mass media, and mediated communication) within a variety of health care contexts.

COMM-C#650 Health Communication Media (3 cr.) Focus on the effect of media on health behavior. Theories of health behavior change and media effects examined; applications of theory to health campaigns evaluated. Examples of mediated health campaigns and effectiveness discussed. Considerations include: interplay among theory, research, practice; how theory informs practice; how research aids in theory construction/refinement.

COMM-C 695#Communication and Healthcare (3 cr.) This seminar offers an interface between learning from practicing providers and experts in medical care specialties and becoming enmeshed in health communication research. The course is structured so that the student gains insights from experts in the medical field while also gaining an overview of research issues through reading and engaging in health communication research.

ENG-G 513 Academic Writing Grad Students (3 cr.) Designed to meet the academic writing needs of ESL graduate students from multiple disciplines, this course focuses on a variety of academic writing styles and disciplinary approaches to producing research papers and professional documents. Students practice paraphrasing, summarizing, critiquing discipline-related articles, as well as writing research proposals and a comprehensive research paper.

ENG-G 520 Communication Skills for International Graduate Students and ITA's (3 cr.) Designed for graduate students who are non-native speakers of English, this course provides instruction on oral communication skills, academic presentation skills and basic teaching strategies for the U.S. classroom. The primary focus is on oral language skills necessary to present academic materials in English to an American audience. Language skills, teaching skills, and knowledge about the U.S. classroom culture will be developed through discussions and classroom observations/simulations. Presentations, teaching practice and regular conferences will focus on individual needs.

ENG-W 600 Topics in Rhetoric and Composition (4 cr.) Covers selected issues in current composition and rhetorical theory.

HIST-H 546 History of Science, medicine and Technology (3 cr.) Study of topics in the history of science, medicine, and technology.

JOUR-J 528 Public Relations Management (3 cr.) Designed to enable students to manage a public relations department. Theories and principles relevant to public relations practiced in agency, corporate and not-for-profit organizations will be covered. This will include developing goals and objectives, working with clients, developing budgets, and research methods.

JOUR-J 560 Topics Colloquium (1-6 cr.) Topical seminar dealing with changing subjects and material from semester to semester.

PBHL-H 612 Marketing for Health Services Delivery (3 cr.)

PBHL-S 625 Applied Public Health Campaigns and Social Marketing Strategies (3 cr.)

PBHL-S 622 Coaching for Health Behavior Change (3 cr.)

PBHL-E 606 Grant Writing: From Befuddlement to Brilliance (3 cr.)

Biology

School of Science

Department of Biology

723 W. Michigan Street, SL 306

Indianapolis, IN 46202-5132

Phone: (317) 274-0577; fax: (317) 274-2846

Department URL: science.indianapolis.iu.edu/biology

Department Chair: Benjamin Perrin, Ph.D.

Graduate Program Advisor: Lata Balakrishnan, Ph.D.

Curriculum

Courses

Degrees Offered

Master of Science in Biology (M.S.)(thesis and non-thesis)

Doctor of Philosophy in Biology (Ph.D.)

Ph.D. Minor in Developmental Biology & Genetics

Ph.D. Minor in Neurobiology

Ph.D. Minor in Physiology

Ph.D. Minor in Scientific Foundations

Program Description

The Department of Biology offers graduate study leading to the Master of Science (M.S.) degree. The M.S. degree program may be completed with a thesis option or with a non-thesis option. The Doctor of Philosophy (Ph.D.) degree can be pursued in a variety of areas through the IU Graduate School Indianapolis. Research is central to the Department of Biology's undergraduate and graduate programs. Students can pursue work across a range of areas, including biochemistry, bone biology, cell biology, developmental biology, entomology, forensic biology, neurobiology, physiology, and regenerative biology. To explore faculty working in these areas, click [here](#).

Admissions Requirements

Students must hold a baccalaureate degree from an accredited institution of higher learning and demonstrate good preparation in the following subjects: Biological Sciences, Organic Chemistry, Physics, and Mathematics. A minimum graduation grade-point index of 3.00 or equivalent is required for unconditional admission. An undergraduate GPA of 3.00 or higher does not guarantee admission. Applicants with GPAs of 3.00 or slightly above will be expected to have a science course GPA of 3.00.

Transfer Students – Transfer credits from other institutions of higher learning cannot be used to replace the minimum of 9 hours of Biology Department course work required for the M.S. thesis degree. Up to 12 hours of Biology graduate credits taken at IU Indianapolis by graduate non-degree students may be transferred to the

non-thesis option. At least half of the coursework hours in a Ph.D. program of study must be taken while enrolled at IU Indianapolis.

Residence Requirements – Thirty (30) credit hours of registration are required for the M.S. degree. Students entering with advanced standing from another graduate school are given residence credit commensurate with the graduate work accomplished.

Application Process: *Remember: All materials must be submitted to the department before the Graduate Committee will review the application file.*

Online Application – In the online application, please make sure you complete all sections. This includes the Personal Statement, Departmental Question, and Recommendations sections. It is helpful to include your name on all typed, uploaded documents. In the Educational Objective section, you must select Academic Objectives: Biology. Personal Statement: Provide a statement (approximately 750 words) that identifies your academic goals, career objectives, why you are applying to this specific program, and the qualifications you have that make you a strong candidate for this program. For M.S. Thesis and Ph.D. applicants, identify at least one faculty member with whom you would be interested in working. In the Departmental Question section, you must specify which program you are pursuing. The choices are as follows: M.S. Non-Thesis, M.S. Thesis, and Ph.D. Simply write a sentence saying “I am applying for the [chosen] program.” and upload it. The last step before submitting an online application is the application fee, which you must pay in order to submit your application. Important Note: An email will be sent to you when our department receives your complete application. If you do not receive an application submission email within 3–4 weeks, please email or call to verify that we have it. We have had several students mistakenly select the wrong Academic Objective so their application goes to another department. It is important to check your email to verify we received your application. If your application is misdirected, it can be easily switched over to our department.

Letters of Recommendation – Three signed letters of recommendation on letterhead are required. At least two must come from professors in previous science courses and speak to the applicant's academic aptitude and potential for graduate-level work in science. Letters are preferred via the online application portal. Recommenders who prefer not to submit online may mail a standard letter directly to the department; an optional recommendation form is available but not required. To request the form, contact the Department of Biology at (317) 274-0577 or biograd@iu.edu with your mailing address. We also accept university committee packets.

Official Transcripts – Send two (2) official copies of transcripts from all attended institutions (including any IU campus) directly to the Biology Department:

IU Indianapolis Biology Department – ATTN: Graduate Secretary
723 West Michigan Street, SL 306
Indianapolis, IN 46202.

Official GRE and TOEFL Scores – (*TOEFL scores are for international students only*). The GRE and/or

subject tests are not required for Ph.D. and Thesis M.S. applicants. However, if submitted, the results are added to the applicant's file for consideration. Only non-thesis M.S. applicants are required to take the Graduate Record Examination (GRE) General Test. Minimal score requirements for the GRE are as follows: a combined GRE score of 295 for the verbal and quantitative sections (with a verbal score of 146 or greater, quantitative score of 145 or greater, and a 5 on the analytical portion). GRE and TOEFL codes: IU Indianapolis = 1325, Biology Department = 0203. Refer to Graduate School policy for English Proficiency requirements.

Application Deadlines

M.S. Thesis (full-time with support): March 1 (Fall) | October 1 (Spring) M.S. Non-Thesis: August 1 (Fall) | December 1 (Spring)

Ph.D.: Priority deadline December 15; applications accepted through March 1

International students must submit by December 15; late applications will not be considered and application fees are non-refundable.

For inquiries after March, contact the Director of Graduate Studies at biograd@iu.edu.

Master of Science in Biology (M.S.)(thesis and non-thesis)

Program Learning Outcomes

- **Conduct** independent research under the supervision of a research advisor to design, test, and analyze original laboratory and/or field experiments.
- **Demonstrate** the ability to read, interpret, and incorporate the results of primary literature into the research design.
- **Employ** rigorous approaches to data collection, replication of experimental results, setup of experimental controls and sampling design, and organization of raw data.
- **Summarize**, describe, and analyze patterns in data; interpret results and draw conclusions from data to defend an argument.
- **Present and communicate** research results to peers through a poster presentation, research seminar and/or publication of results.
- **Write and defend** a thesis that demonstrates mastery in at least one discipline of biological sciences.

M.S. Non-thesis in Biology.

Program Requirements

This program requires a minimum of 30 credit hours of registration, at least 21 of which must be in biology. For students who wish to combine biology training with work in a secondary area as a mechanism to meet career objectives, up to 9 credit hours can be taken in the secondary area. Advanced-level undergraduate course work hours are limited to 6. Examples of secondary areas include, but are not limited to, chemistry, mathematics, public affairs, business, statistics, law, computer science, administration, and, for those interested in teaching, education. For those students with no secondary area of interest, all 30 credit hours may be taken in biology.

The program requires registrations in BIOL-I 595 Special Assignments and BIOL-I 696 Seminar. The former consists of an independent, creative project done in association with a faculty member. Typical examples include a limited laboratory research experience or a library research assignment. The results of the project are reported both in writing and orally in BIOL-I 696. Curriculum is as follows:

- **Required Core Courses (6 credits)**
 - BIOL-I 697 Introduction to Biochemistry
 - BIOL-I 697 Biomedical Genetics
- **Electives (take at least 24 credits in total)**
 - BIOL-I 507 Principles of Molecular Biology
 - BIOL-I 512 ADVANCED CELL BIOLOGY
 - BIOL-I 556 Physiology I
 - BIOL-I 557 Physiology II
 - BIOL-I 559 Endocrinology
 - BIOL-I 561 Immunology
 - BIOL-I 564 Molecular Genetics Development
 - BIOL-I 566 Developmental Biology
 - BIOL-I 573 Stem Cell Biology
 - BIOL-I 574 Molecular and Cell Bone Biology
 - BIOL-I 625 Immune System Disorders
 - BIOL-I 697 Special Topics: Neuroscience
 - BIOL-I 697 Special Topics: Population Genetics
 - BIOL-I 697 Special Topics: Neuropharmacology
 - BIOC-B 500 INTRODUCTORY BIOCHEMISTRY
 - MGEN-Q 580 BASIC HUMAN GENETICS
- **Final Examination** – A comprehensive written or oral examination in the individual's primary area may be required of non-thesis students unless their cumulative GPA is 3.00 or higher. The final examination for thesis students will consist of a thesis defense, which will be done in conjunction with BIOL-I 696 Seminar. All students (except for Pre-Professional Non-Thesis students) are required to take BIOL-I 696 Seminar. The creative project required of all non-thesis students will provide the basis for the public presentation.

MS Thesis Option

Degree Requirements

This 30-credit hour program requires a minimum of 18 credit hours of 500-level and 600-level course work in biology chosen in consultation with the student's graduate advisory committee, and intensive research leading to a thesis. Most full-time students should expect to spend at least two full years to complete this program. Areas in which research opportunities are available include: biochemistry, bone biology, cell biology, developmental biology, entomology, forensic biology, neurobiology, physiology, and regenerative biology. The overall emphasis of the department's research program focuses on questions at the cellular, biochemical, and molecular levels. Many of the projects provide a foundation in biotechnology and an excellent preparation for biomedical and industrial applications.

The curriculum is as follows:

- **Required Core Courses (9 credits)**
 - BIOL-I 697 Special Topics: Research Methods
 - BIOL-I 609 Research Boot Camp
 - BIOL-I 595 Biology Seminar
- **Electives Courses (take at least 9 credits)**
 - BIOL-I 507 Principles of Molecular Biology
 - BIOL-I 512 ADVANCED CELL BIOLOGY
 - BIOL-I 556 Physiology I
 - BIOL-I 557 Physiology II
 - BIOL-I 559 Endocrinology
 - BIOL-I 561 Immunology
 - BIOL-I 564 Molecular Genetics Development
 - BIOL-I 566 Developmental Biology
 - BIOL-I 573 Stem Cell Biology
 - BIOL-I 574 Molecular and Cell Bone Biology
 - BIOL-I 625 Immune System Disorders
 - BIOL-I 697 Special Topics: Cell & Molecular Neuroscience
 - BIOL-I 697 Special Topics: Population Genetics
 - BIOL-I 697 Special Topics: Neuropharmacology
 - BIOL-I 697 Special Topics: Scientific Writing
 - BIOC-B 500 INTRODUCTORY BIOCHEMISTRY
 - MGEN-Q 580 BASIC HUMAN GENETICS
- **Thesis Research (12 credits)**
 - BIOL-I 698 Research MS Thesis

Doctor of Philosophy in Biology

Program Description

The degree of Doctor of Philosophy (Ph.D.), the highest earned degree conferred by Indiana University, can be pursued in the Department of Biology at IU Indianapolis. The doctoral degree is restricted to those scholars who have demonstrated superior ability in a recognized academic discipline. The Ph.D. degree is not awarded on the basis of time spent in residence or following the completion of any specific number of formal courses, nor is the degree granted on the basis of miscellaneous course studies and research effort. The entire Ph.D. program must be rationally related, should be highly research-oriented, and should culminate in a thesis of scholarly merit indicative of the candidate's ability to conduct original research in a recognized field of specialization. Ph.D. programs are directed by professors who work in close association with selected graduate students. In practice, doctoral programs are composed of formal courses, guided individual study in a chosen field or discipline, study in such cognate subjects as may be required by the candidate's advisory committee, and original research that serves as the basis of a scholarly thesis. As part of their graduate training, all Ph.D. candidates are expected to teach at least quarter-time for one year. Ninety (90) credit hours of registration are required for the Ph.D. degree. Students entering with advanced standing from another graduate school are given residence credit commensurate with the graduate work accomplished.

Fields of Study – Ph.D. degrees are offered in most of the fields described for the M.S. degree. Until a major professor is named, a student is counseled by a temporary advisor. In order to help familiarize students with the department and to assist in the selection of a major professor, a series of laboratory rotations is available.

Admission and First Year Review – To enter the Ph.D. program, a student must satisfy the admission requirements for the M.S. (with thesis option) and also submit a critical review at the end of the first year of graduate study. In their second semester, students write a critical review paper detailing a problem or knowledge gap in their area of research, along with an assessment of the literature to propose a specific solution to this problem. In the fall of their second year, students present the review to their graduate committee. For this first committee meeting, the student will prepare a presentation to recap the review for the committee. In addition, they may incorporate some of their preliminary data from the laboratory (either linked to, or separate from, the review). As with other committee meetings, the committee will vote to pass or fail. If the student fails this committee meeting, the student must rewrite the critical review and pass a committee meeting prior to taking the preliminary examination.

Program Learning Outcomes

In addition to the above outcomes, students completing the Ph.D. in Biology will be able to:

- Demonstrate a comprehensive knowledge in biological sciences through successful completion of a qualifying and preliminary examination.
- Document an original contribution to biology through independent experimental design, peer-reviewed publication of results, and presentation and defense of a thesis.

Degree Requirements

Each prospective candidate for the doctoral degree, with the approval of the Head of the Department of Biology, shall select a major professor from the department who will act as the chairperson of the student's advisory committee and direct their research. The student, in consultation with the major professor, will arrange an advisory committee of at least four faculty members (including the major professor) who have been approved to guide graduate students. The plan of study shall include required core Biology courses and may include additional courses in the primary area of study. The plan will be appropriate to meet the needs of the student in a chosen field as determined by the advisory committee. All Ph.D. students must also complete a minor composed of at least 6 credit hours of coursework in a related area (chosen in consultation with the research committee). The plan will include the core and minor courses the student is expected to complete, additional specific courses relevant to the field of research, any language requirements, and 2 credit hours of BIOL-I 696 Seminar. The department head and the Dean of the IU Graduate School Indianapolis must approve the plan of study. To complete the program, the student must satisfy all of the following overall requirements:

- Required Courses in the First Year (9 credits):
 - BIOL-I 609 Scientific Research Boot Camp
 - BIOL-I 512 Advanced Cell Biology

- BIOL-I 697 Scientific Writing
- BIOL-I 507 Principles of Molecular Biology
- BIOL-I 595 Required Special Assignment, taken every fall and spring semester for 1 credit each
- Additional Required Coursework
 - BIOL-I 595 Biology Special Assignment (9 credits total required)
 - BIOL-I 696 Required Seminar Course, taken twice for 2 total credits
- Dissertation Research or Electives (70 credits): Students must complete 70 total credits in dissertation research or elective coursework.
 - Optional Elective Courses- Reduce dissertation research to total 70 credits. Other pre-approved courses may also count
 - BIOL-I 556 Physiology I
 - BIOL-I 557 Physiology II
 - BIOL-I 559 Endocrinology
 - BIOL-I 561 Immunology
 - BIOL-I 564 Molecular Genetics of Development
 - BIOL-I 566 Developmental Biology
 - BIOL-I 573 Stem Cell Biology
 - BIOL-I 574 Molecular and Cell Bone Biology
 - BIOL-I 697 Special Topics
- BIOL-I 699 Dissertation Research.
- Minor Requirements (6 credits): Students must also complete a minor, consisting of at least 6 credits outside of their major.

Qualifying Examination – After the student has completed most of their formal coursework to the satisfaction of the advisory committee and met any language requirement(s), the student becomes eligible to take the qualifying examination in order to advance to candidacy. The qualifying examination must be taken within one year of, and at least six months after, passing the first committee meeting. The examination requires a research proposal to be written by the student in consultation with their major professor. The results of these written and oral examinations will be reported to the graduate school by the examining committee with an appropriate recommendation for admission to candidacy, continued preparatory study, or discontinuation. The graduate school associate dean reserves the right to appoint additional members to the qualifying examining committee (no examining committee shall have fewer than three faculty members). If the student does not pass the qualifying examination, a second meeting must be convened within 6 months. Should the qualifying examinations be failed twice, the student may not be given a third examination, except upon recommendation of the examining committee and with special approval of the Graduate Council.

Ph.D. Dissertation – After admission to candidacy, the candidate must devote at least two semesters to research before the final examination. The special research carried on as part of the doctoral work is expected to make a definite contribution to the candidate's chosen field of knowledge – a contribution of sufficient importance to merit publication. Each candidate must, therefore, prepare

a dissertation showing the research results. After the research has been completed and the dissertation written, the candidate shall be given a final examination in which they defend the dissertation and demonstrate to the examining committee all of the capabilities for which the Ph.D. degree is awarded.

Biology Minors in the School of Science

Developmental Biology & Genetics

- Courses (take at least 6 credits)
 - FIS-I 560 Population Genetics
 - NSCI-I 560 Behavioral Genetics
 - BIOL-I 564 Molecular Genetics of Development
 - BIOL-I 566 Developmental Biology
 - NSCI-I 571 Developmental Neurobiology
 - BIOL-I 573 Stem Cell Biology
 - MGEN-Q 580 Basic Human Genetics
 - PSY-I 535 Developmental Neuroscience

Neurobiology

- Courses (take at least 6 credits)
 - NSCI-I 560 Behavioral Genetics
 - BIOL-I 569 Cellular Neurobiology
 - NSCI-I 561 Immunology
 - NSCI-I 559 Endocrinology
 - NSCI-K 451 Neuropharmacology
 - PSY-I 545 Psychopharmacology
 - PSY-I 570 Drugs of Abuse

Physiology

- Required Course (3 credits)
 - BIOL-I 556 Physiology I
- Elective Courses
 - BIOL-I 559 Endocrinology
 - BIOL-I 561 Immunology
 - BIOL-I 571 Developmental Neurobiology

Scientific Foundations (take at least 6 credits)

- BIOL-I 609 Scientific Research Boot Camp
- FIS-N 570 Laboratory Project Design
- FIS-I 540 Forensic Biology I
- FIS-I 560 Population Genetics
- CHEM-I 533 Introductory Biochemistry
- BIOL-I 507 Principles of Molecular Biology
- BIOL-I 512 Advanced Cell Biology
- GEOL-G 567 Geohealth: When Our Health Collides with Our Environment
- GEOL-G 585 Environmental Geochemistry
- PSY-I 570 Drugs of Abuse
- PSY-I 518 Memory and Cognition
- STAT-I 514 Design of Experiments
- PBHL-B 561 Introduction to Biostatistics I

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Courses

Course Description

BIOL-I 507 Principles of Molecular Biology (3 cr): Molecular aspects of structure and function of nucleic acids and proteins, including recombinant DNA research. Prokaryotic and eukaryotic molecular biology are given equal weight.

BIOL-I 512 ADVANCED CELL BIOLOGY (3 cr): This course provides detailed analysis of cell biology, gene regulation and applications of cell biology and genetics. This is a lecture, literature and presentation driven course that utilizes an advanced graduate level textbook as a foundation to dive into recent primary literature on new and emerging topics in cell biology.

BIOL-I 556 Physiology I (3 cr): General and comparative physiology. Principles of physiology. Nerve and muscle, temperature regulation, ion and water balance. The critical evaluation of original research papers.

BIOL-I 557 Physiology II (3 cr): A study of the human cardiovascular, pulmonary, blood, and gastrointestinal systems. Higher neuronal functions and intersystem interactions will be discussed.

BIOL-I 559 Endocrinology (3 cr): The study of hormone function. Consideration will be given to the role of hormones in growth, development, metabolism, homeostasis, and reproduction.

BIOL-I 561 Immunology (3 cr): Introduction to the basic principles and experimentation in cellular and humoral immunology.

BIOL-I 564 Molecular Genetics of Development (3 cr): The course examines the genetic and developmental bases as well as phenotypes of 40 genetic disorders. Chromosomal, single gene, complex and developmental genetic disorders are studied in detail. Emphasis is placed on molecular techniques and understanding current primary literature.

BIOL-I 566 Developmental Biology (3 cr): Principles of development with emphasis on concepts and experimental evidence for underlying mechanisms, including molecular, cellular, and supracellular approaches.

BIOL-I 571 Developmental Neurobiology (3 cr): The major phases of nervous system development beginning with neuroulation and neurogenesis and ending with the onset of physiological activity will be studied in a variety of animals, mainly avians and mammals (including man). Neural developmental disorders and behavioral ontogeny will also be considered.

BIOL-I 573 Stem Cell Biology (3 cr): In this course, students will develop a clear understanding of stem cells' defining features, activities and potential utility. Stem cell research is pursued in nearly all areas of medicine. This course focuses on important definitions and characteristics of stem cells and develops a general overview of stem cell biology. The course builds on this overview of stem cell biology by examining specific examples of developmental biology, methodology and the potential applications of stem cell therapy.

BIOL-I 574 Molecular and Cell Bone Biology (3 cr): This course is designed for graduate and senior

undergraduate students. Concentration on basic cellular and molecular concepts of bone and cartilage with applications to engineering concepts. Topics include bone development and growth, cartilage and chondrocyte, signal transduction in bone cells, stem cells, skeletal regeneration, tissue engineering, gene therapy and cancer bone metastasis.

BIOL-I 595 Biology Seminar (1-4 cr): Special work, such as directed reading, independent study or research, supervised library, laboratory, or field work, or presentation of material not available in the formal courses of the department.

BIOL-I 609 Scientific Research Boot Camp (3 cr): This course introduces graduate students (Thesis Master and Ph.D.) to research approaches, research presentation skills, and the proper conduct of research. This bootcamp course fulfills the requirement for Responsible Conduct in Research training that is required for students with certain funding and paid from NIH/HSF grants.

BIOL-I 625 Immune System Disorders (3 cr): The aim of this course is to understand the underlying mechanisms that contribute to immune system dysfunction. We will discuss the genetic defects in the immune system, immune complex diseases, immune mediated hypersensitivity reactions and autoimmune diseases. This course covers fundamentals as well as current topics in the field of immunology.

BIOL-I 696 Required Seminar Course (1 cr): Each semester there are several separate offerings. Oral presentations are required. May be repeated for credit.

BIOL-I 697 SPECIAL TOPICS: Biomedical Genetics (1-3)

BIOL-I 697 SPECIAL TOPICS: Introduction to Biochemistry (1-3 cr)

BIOL-I 697 SPECIAL TOPICS: Scientific Writing (3 cr)

BIOL-I 698 Research MS Thesis (1-18 cr)

BIOL-I 699 Dissertation Research (1-18 cr)

Communication Studies

Contact Information

IU Online Academic Programs: iuoacad@iu.edu

Degree offered

Graduate Certificate in Communication Studies (IU Online)

Program Information

The fully online IU Online Graduate Certificate in Communication Studies provides advanced instruction in communication strategies, practices, and techniques. As a student in this certificate program, you will gain practical communication skills for use in professional, academic, and personal contexts. Develop innovative strategies for teaching communication, employ effective and ethical communication practices, and apply critical perspectives to production and consumption of media messages. The IU Online Graduate Certificate in Communication Studies prepares students for such careers as:

- Communication dual-credit teacher (high school)
- Communication instructor (community college)

- Communication professional in an organization or institution

Admission Requirements

- A bachelor's degree
- 3.0 GPA or above on a 4.0 scale
- Official transcripts
- A 250-word statement that briefly describes your background and goals for entering this degree program

Application Dates

- **Summer 2026** will be the final semester for which this program is accepting applications.
- Application Deadline: June 3, 2026
- Classes begin: June 8, 2026

Student Learning Outcomes

Program Goals

1. Deploy innovative strategies for teaching communication.
2. Employ effective and ethical communication practices to achieve professional, academic, and personal goals.
3. Apply critical perspectives when producing and consuming media messages.

Program Learning Outcomes (PLOs)

1. Develop learning experiences about communication studies based upon best practices in teaching and learning.
2. Apply theoretical concepts of communication studies to the construction of scholarly/creative works.
3. Respond ethically to achieve communication goals for themselves, others, and society.
4. Synthesize ideas from scholarly literature in the fields of communication studies and/or media studies.
5. Analyze the creation/consumption of media and/or mediated messages through the lens of scholarship in communication studies and/or media studies.

Certificate Course Requirements

The Graduate Certificate in Communication Studies requires completion of six courses for 18 credits and provides graduate-level instruction in communication strategies, practices and techniques for students interested in obtaining advanced skills and knowledge.

Requirements:

1. Communication Pedagogy

Complete CMCL-C 545 Pedagogy in Communication and Culture (3 Cr).

2. Communication in Context

Complete three courses chosen from the following list (9 Cr):

- COMM-C 510 Health Provider-Consumer Communication
- COMM-C528 Group Communication and Organizations
- COMM-C 544 Advanced Relational Communication

- CMCL-C 500 Intro to Graduate Studies and Research
- CMCL-C 550 Family Communication
- CMCL-C 592 Advanced Health Communication
- CMCL-C 593 Topics in Communication: approved topics
- CMCL-C 594 Communication and Conflict Management in Organizations
- CMCL-C 610 Identity and Difference
- ENG-R 546 Rhetoric and Public Culture
- JOUR-J 522 Political Communication
- SPCH-S 502 Intro to Communication Theory
- SPCH-S627 Studies in Cross Cultural Communication
- SPCH-S633 Studies in Interpersonal Communication
- SPCH-S640 Studies in Organizational Communication

3. Communication in Media

Complete one of the following three courses (3 Cr)

- CMCL-C 593 Topics in Communication: VT: Social Media and Communication
- CMCL-C 602 Media, Terrorism, and Politics
- CMCL-C 606 Media Criticism
- CMCL-C 621 Social Media and Communication
- COMM-C 530 Communication Criticism
- COMM-C 531 Media Theory and Criticism

4. Communication Studies Elective

Complete an additional course selected from the courses listed above (3 Cr).

Timeline / Milestones

• Transfer Credit

Transfer credit, satisfactory academic progress, and dismissal from the certificate program will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*. Current policy is as follows:

Transfer Credit: With the approval of the steering committee and in accordance with pertinent IU policies, students may transfer in one four- credit course in partial satisfaction of certificate requirements. No course may be transferred from another institution unless the grade is a B or higher.

Satisfactory Academic Progress and Dismissal

3.0 GPA required for good standing. Any semester's work averaging less than B will result in the student being placed on academic probation. Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The department evaluates each student's progress toward the degree every year.

Dismissed students must sit out at least one semester. The curriculum committee will read petitions from students seeking re-entry on a rolling basis. The committee will look for evidence that the student has addressed the underlying issues and obstacles to academic success. Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses

Course Number	Course Name	Credits
CMCL-C 502/ SPCH-S 500	Intro to Communication Theory	3 Cr
COMM-C/CMCL-C 592	Advanced Health Communication	3 Cr
SPCH-S 633	Studies in Interpersonal Communication	3 Cr
CMCL-C 545	Communication Pedagogy	3 Cr
CMCL-C 594	Communication and Conflict Management in Organizations	3 Cr
CMCL-C 606	Media Criticism	3 Cr
CMCL-C 610	Identity and Difference	3 Cr
COMM-C 510	Health Provider-Consumer Communication	3 Cr
COMM-C 528	Group Communication and Organizations	3 Cr
COMM-C 544	Advanced Relational Communication	3 Cr
COMM-C 582	Advanced Intercultural Communication	3 Cr
COMM-C 593	Family Communication	3 Cr
SPCH-S 500	Intro to Grad Studies and Research	3 Cr
SPCH-S 627	Studies in Cross-Cultural Communication	3 Cr
SPCH-S 640	Studies in Organizational Communication	3 Cr

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Composition Studies (IU Online)

Contact Information

IU Online Academic Programs— iuoacad@iu.edu

Degree Offered

Graduate Certificate in Composition Studies (IU Online)

Program Information

The fully online IU Online Graduate Certificate in Composition Studies provides teachers with strategies and techniques to teach core composition skills such as how to craft sound arguments using close attention to logic, context, and audience. Areas of focus include:

- Contemporary theory on the pedagogy of composition and literature
- Linguistic structures and history of the English language
- Reading strategies and literary analysis, with attention to close reading, style, form, genre, and rhetorical practices
- Approaches to composition and writing instruction, including the identification and evaluation of sources, use of evidence, generation of ideas, and the development and organization of arguments
- Developing archival research skills and facility with electronic resources
- Developments, trends, and frontiers in the digital humanities

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Graduate Certificate in Literature is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 20-credit hour Graduate Certificate in Literature.
- If you plan to pursue the [IU Online M.A. in English](#), you may apply the 20 credit hours from the Graduate Certificate in Composition toward the master's degree.

Special Program Requirements

To be accepted to this program, you must have:

1. A bachelor's degree
To enroll in this program, you must possess either a B.A. in English (or related bachelor's degree in education with an English specialization, concentration, or outside area) or two years of secondary teaching experience in literature or composition
2. 3.0 GPA or above on a 4.0 scale

To apply to this program:

Complete an online application that includes:

- Transcripts

- A 250-word personal statement explaining your background and reasons for entering the program
- TOEFL scores (international students only)

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Summer 2 semester: Jun 15

Program Learning Outcomes

1. Demonstrate command of the core principles of writing pedagogy
2. Deploy a wide variety of strategies to teach writing at the college level
3. Display analytical and presentation skills developed through the focused study of composition in a seminar format
4. Develop facility with research tools, practices, and relevant technologies in composition studies

Certificate Course Requirements

To earn the IU Online Collaborative Graduate Certificate in Composition Studies, students must complete five graduate English courses. All courses are four credits.

Course requirements are as follows:

Introductory Course--Graduate Composition Studies—

Complete one of:

- ENG W509 Introduction to Writing and Literacy Studies, **or**
- ENG W500 Teaching Composition

Stylistics

Complete one of:

- ENG G660 Stylistics
- ENG L646 Readings in Media, Literature, and Culture

Applied Writing Pedagogy

Complete one of:

- ENG W510 Computers in Composition
- ENG W553 Theory and Practice of Exposition
- ENG W590 Teaching Composition: Theories & Applications
- ENG W620 Advanced Argumentative Writing

Writing Pedagogy for College Instructors

Complete one of:

- ENG W501 Practicum on Teaching of Composition in College
- ENG W600 Topics in Rhetoric and Composition

Rhetoric Seminar or Capstone

Complete one of:

- ENG R546 Rhetoric and Public Culture
- ENG W600 Topics in Rhetoric and Composition
- ENG W602 Contemporary Theories in Rhetoric and Composition

- ENG W682 Special Topics in Rhetoric and Composition

Timeline / Milestones

Transfer Credit

Transfer credit, satisfactory academic progress, and dismissal from the certificate program will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*. Current policy is as follows:

Transfer Credit: With the approval of the steering committee and in accordance with pertinent IU policies, students may transfer in one four-credit course in partial satisfaction of certificate requirements. No course may be transferred from another institution unless the grade is a B or higher.

Satisfactory Academic Progress and Dismissal

3.0 GPA required for good standing. Any semester's work averaging less than B will result in the student being placed on academic probation. Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The department evaluates each student's progress toward the degree every year.

Dismissed students must sit out at least one semester. The curriculum committee will read petitions from students seeking re-entry on a rolling basis. The committee will look for evidence that the student has addressed the underlying issues and obstacles to academic success. Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses

Course Number	Course Name	Credits
ENG G 660	Stylistics	4 Cr
ENG L 646	Readings in Media, Literature, and Culture	4 Cr
ENG W 500	Teaching Composition	4 Cr
ENG W 501	Practicum on Teaching of Composition in College	4 Cr
ENG W 509	Introduction to Writing and Literacy Studies	4 Cr
ENG W 510	Computers in Composition	4 Cr
ENG W 553	Theory and Practice of Exposition	4 Cr
ENG W 590	Teaching Composition: Theories & Applications	4 Cr

ENG W 600	Topics in Rhetoric and Composition	4 Cr
ENG W 602	Contemporary Theories in Rhetoric and Composition	4 Cr
ENG W 620	Advanced Argumentative Writing	4 Cr
ENG W 682	Special Topics in Rhetoric and Composition	4 Cr
ENG W 600	Topics in Rhetoric and Composition	4 Cr
ENG R 546	Rhetoric and Public Culture	4 Cr

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

English (IU Online)

Contact Information

IU Online Academic Programs—iuoacad@iu.edu

Degree Offered

Master of Arts in English (IU Online)

Program Information

The IU Online Master of Arts in English focuses on language skills with a broad training in the primary areas of English studies. Students in the program:

- explore the core principles of writing and literature
- acquire flexible English language skills through a humanities-based education!
- develop analytical and presentation skills through the focused study of literature
- acquire an appreciation of trends in the field of digital humanities
- gain the skills to conduct archival research.

Students complete coursework in one of three areas of interest chosen from [literature](#), [composition studies](#), or [language and literature](#).

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Master of Arts in English is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing one of

three 20-credit hour IU Online Graduate Certificates in [literature](#), [composition studies](#), or [language and literature](#).

- Students who need to earn a M.A. in English to become eligible to teach dual-credit literature and/or composition classes can apply directly to the IU Online Master's program.

Degrees Offered

Master of Arts in English

Special Program Requirements

To be accepted to this program, you must have successfully completed:

1. One of the following graduate certificates: Composition Studies, Language and Literature, or Literature
2. At least three courses in one of the certificate programs with a 3.5 or higher GPA

To apply to this program:

Complete an online application that includes:

- A 250-word personal statement describing your background and reasons for entering the program
- Two letters of recommendation

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Summer 2 semester: Jun 15

Program Learning Outcomes

Upon completion of the collaborative Master of Arts in English, students will:

1. Demonstrate command of the core principles of writing and literature pedagogy
2. Demonstrate basic understanding of English's linguistic structures and history.
3. Deploy a wide variety of reading strategies associated with periodization, genre, and close reading, and possess the knowledge and tools necessary to teach these skills
4. Display analytical and presentation skills developed through the focused study of literature and/or composition
5. Develop facility with research tools, practices, and relevant technologies in English studies.

Degree Course Requirements

To earn the M.A. in English, you must complete 36 credit hours.

This degree has a two-part "stackable" structure.

- You first complete an online 20 credit hour graduate certificate in [literature](#), [composition studies](#), or [language and literature](#). The certificate allows you to acquire specialized knowledge.
- After you successfully complete one of the certificates, you take an additional 16 credits of master's-level coursework that extends the breadth and depth of your knowledge.

Requirements are broken down as follows:

- English graduate certificate (20 credit hours)
- M.A. core courses (8 credit hours)
- M.A. elective courses (8 credit hours)

Degree Structure and Requirements

Students pursuing the collaborative M.A. in English will complete a two-part degree program that includes a 20-credit stand-alone graduate certificate chosen from the following three options, Literature, Language & Literature, or Composition Studies (Part I), and 16 credits of additional master's degree coursework (Part II).

Required courses for the online M.A. in English will run using the ENG subject code and carry 4 credits.

Part I: Completion of one following three Graduate Certificate options (20 credits)

Option #1 Graduate Certificate in Literature

To earn the Graduate Certificate in Literature, students must complete five graduate courses for 20 credits.

Course requirements are as follows:

Introductory Course—Teaching Literature at the College Level

- ENG-L 503 Teaching of Literature in College

History, Methods, and Practice of Literary Study

- ENG-L 553 Studies in Literature

Course on the History and Development of the English Language or English Literature

Complete one of:

- ENG-D 600/ENG-G655 History of the English Language
- ENG L625 Readings in Shakespeare
- ENG L639 English Fiction To 1800
- ENG L641 English Literature 1790-1900
- ENG L660 Studies in British and American Literature
- ENG L681 Genre Studies

4&5) Two Electives—any two ENG-L courses (in addition to L503 and L553)

- ENG-L class at the 500/600 level
- ENG-L class at the 500/600 level

Option #2 Graduate Certificate in Language and Literature

To earn the Graduate Certificate in Language and Literature, students must complete five graduate courses for 20 credits.

Course requirements are as follows:

Introductory Course—Graduate Composition Studies

Complete one of:

- ENG W509 Introduction to Writing and Literacy Studies, **Or**
- ENG W500 Teaching Composition

Introductory Course—Teaching Literature at the College Level

- ENG L503 Teaching of Literature in College

Course on the History and Development of the English Language or English Literature

Complete one of:

- ENG-D 600/ENG-G655 History of the English Language
- ENG-L 625 Readings in Shakespeare ENG L639 English Fiction To 1800
- ENG L641 English Literature 1790-1900
- ENG L660 Studies in British and American Literature
- ENG L681 Genre Studies

Writing Pedagogy for College Instructors

Complete one of:

- ENG W600 Topics in Rhetoric and Composition
- ENG W602 Contemporary Theories of Rhetoric and Composition
- ENG W682 Special Topics in Rhetoric and Composition
- ENG W508 Graduate Creative Writing for Teachers
- ENG W554 Practicum: Teaching of Creative Writing

Certificate Elective

- Complete an additional ENG-L 500/600

Option #3 Graduate Certificate in Composition Studies

To earn the Graduate Certificate in Composition Studies, students must complete five graduate courses for 20 credits.

Course requirements are as follows:

Introductory Course--Graduate Composition Studies—

Complete one of:

- ENG W509 Introduction to Writing and Literacy Studies, **or**
- ENG W500 Teaching Composition

Stylistics

Complete one of:

- ENG G660 Stylistics
- ENG L646 Readings in Media, Literature, and Culture

Applied Writing Pedagogy

Complete one of:

- ENG W510 Computers in Composition
- ENG W553 Theory and Practice of Exposition
- ENG W590 Teaching Composition: Theories & Applications
- ENG W620 Advanced Argumentative Writing

Writing Pedagogy for College Instructors

Complete one of:

- ENG W501 Practicum on the Teaching of Composition in College
- ENG W600 Topics in Rhetoric and Composition

Rhetoric Seminar or Capstone

Complete one of:

- ENG R546 Rhetoric and Public Culture
- ENG W600 Topics in Rhetoric and Composition
- ENG W602 Contemporary Theories of Rhetoric and Composition
- ENG W682 Special Topics in Rhetoric and Composition

Part II: Additional Coursework for the M.A. in English (16 credits)

To earn the Master of Arts in English, students must complete an additional four graduate courses for 16 credits.

2 Courses in Core Skills and Methods of Advanced Literary Study

Complete two courses chosen from the following list (8 credits)

(cannot duplicate certificate enrollments)

- ENG L506 Introduction to the Methods of Criticism and Research
- ENG L646 Readings in Media, Literature, and Culture
- ENG R546 Rhetoric and Public Culture
- ENG W509 Introduction to Writing and Literacy Studies
- ENG W600 Topics in Rhetoric and Composition
- ENG W602 Contemporary Theories of Rhetoric and Composition

2 Electives Courses (8 credits)

Complete any two ENG-X 500/600 level courses.

May include by permission only, ENG-W 609 Independent Writing

Timeline / Milestones

Transfer Credit: Transfer credit, satisfactory academic progress, and dismissal from the certificate program will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*. Current policy is as follows:

Twenty (20) credits from one of three following IU Online graduate certificates will apply to the M.A. in English requirements.

- Graduate Certificate in Composition Studies
- Graduate Certificate in Language and Literature
- Graduate Certificate in Literature

Students who have earned credits from a different accredited college or university may transfer up to 4 credits.

Satisfactory Academic Progress and Dismissal

3.0 GPA required for good standing. Any semester's work averaging less than B will result in the student being placed on academic probation. Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The department evaluates each student's progress toward the degree every year.

Dismissed students must sit out at least one semester. The curriculum committee will read petitions from students seeking re-entry on a rolling basis. The committee will look for evidence that the student has addressed the underlying issues and obstacles to academic success. Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses

Course Number and Title	Credits
ENG-W 509 Writing and Literacy Studies	4
ENG-W 500 Teaching Composition: Issues & Approaches	4
ENG-W 600 Topics in Rhetoric & Composition	4
ENG-W 682 Special Topics: Rhetoric & Composition	4
ENG-W 508 Creative Writing for Teachers	4
ENG-W 554 Practicum Teaching of Creative Writing	4
ENG-L 503 Teaching Literature in College	4
ENG-D 600/G655 History of the English Language	4
ENG-L 625 Readings in Shakespeare	4
ENG-L639 English Fiction to 1800	4
ENG-L 641 English Literature 1790-1900	4
ENG-L 660 Studies in British and American Literature	4
ENG-L 681 Genre Studies	4
Electives	
ENG-L 5XX / ENG-L 6XX Any ENG-L or advisor-approved course	4

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

French MAT (IU online)

Program Name

Master of Arts for Teachers in French (IU Online)

Contact Information

IU Online Academic Programs— iuoacad@iu.edu

Degree offered

Master of Arts for Teachers in French (IU Online)

Program Information

Students in the IU Online Master of Arts for Teachers in French will deepen their proficiency in French through advanced graduate coursework and gain a comprehensive understanding of Francophone cultures and of French as a living language. Study and practice various language teaching methodologies, thereby improving your instructional skills and your students' learning outcomes.

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Master of Arts for Teachers in French is ideal for teachers who need to earn a master's degree in order to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses.

Degrees Offered

Master of Arts for Teachers in French

Special Program Requirements

Admissions

To be accepted to this program, you must have completed:

- An undergraduate degree with a major in French
- OR a related bachelor's degree in education with a French specialization, concentration, or outside area
- OR two years of secondary teaching experience in French and transcripts from a Francophone institution

To apply to this program:

Complete an online application that includes evidence of written and aural facility in French. At the end of the application, you will be presented with a short passage and asked to record yourself reading the passage aloud in French and answering brief questions about its meaning. In order to complete and submit your application, you will need to upload this recording.

Application Dates

Fall semester: Aug 1
Spring semester: Jan 1
Summer 1 semester: May 1
Summer 2 semester: Jun 15

Transfer Credit

Students who have earned credits from different accredited colleges or universities may petition the program faculty committee to review course materials to transfer up to 3 credits of graduate French coursework. Transfer credit is not automatic and subject to program review and approval.

Program Learning Outcomes

Program Goals: Students in the Master of Arts for Teachers in French will:

- Express ideas in written and spoken French comparable to an advanced-low level on the ACTFL scale.
- Analyze cultural artefacts (e.g., practices, products, instruments, traditions) of the French-speaking world using relevant approaches and scholarship.
- Analyze the breadth of current scholarship on second language teaching and learning and apply evidence-based strategies / pedagogies to improve learning in French language classes.

Degree Structure and Requirements

To earn the thirty credit MAT in French students must complete the following coursework:

Core coursework (9 cr)

- FRIT-F580 Applied French –Linguistics (3 cr)
- FRIT-F673 Topics in Learning and Teaching of French (3 cr)
- FRIT-F606/FREN-F606 Capstone Project in French Teaching (3 cr) (completed near conclusion of the program)

Two courses in French/Francophone Studies (500 level or above) (6 cr)

- FREN-F 525 Readings in French or Francophone Culture (3 cr)
- FRIT-F 556 Le Roman aux 20e et 21e siècles (3 cr)
- FRIT-F 561 Studies in French Civilization
- FRIT-T 603 History of the French Language 1 (3 Cr)
- FRIT-F 632 Seventeenth-Century French Drama and Performance (3 cr)
- FRIT-F 635 Studies in Eighteenth-Century French Literature (3 cr)
- FRIT-F 640 Studies in Nineteenth-Century French Literature (3 cr)
- FREN-F 651 Studies in French Cinema (3 cr)
- FREN-F 667 Seminar in Francophone Studies (3 cr)

One French Linguistics course (in addition to F580) (500 level or above) (3 cr)

- FRIT-F 578 Contrastive Study of French and English (3 cr)
- FRIT-F 603 History of the French Language 1 (3 cr)

One course in Foreign Language Methodology, Applied Linguistics and Language Acquisition (3 cr)

- FREN-F 542 Readings in French Pedagogy and Language Acquisition
- FRIT-F 673 Topics in Learning and Teaching of French

Three additional courses taken from any one of the above 3 categories (9 cr)

* With approval of the faculty committee, students may count appropriate courses in language pedagogy towards satisfaction of elective requirements.

Timeline / Milestones

Working professionals taking 3-4 courses per year will be able to complete the Master of Arts for Teachers in French in 2-3 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the M.A.T. French will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*.

Satisfactory Academic Progress

- 0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.
- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.
- The curriculum committee for the collaborative M.A.T. French will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the M.A.T.
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

Course #	Title	Credits
FREN-F525	Readings in French and Francophone Cultures	3
FREN-F531	Readings in French Language and Linguistics	3
FREN-F542	Readings in French Pedagogy and Language Acquisition	3
FREN-F606	Capstone Project in French Teaching	3
FREN-F651	Studies in French Cinema	3
FREN-F667	Seminar in Francophone Studies	3
FRIT-F535	Le XVIII Siecle: L'Essai	3
FRIT-F556	Le Roman aux 20e et 21e siècles	3

FRIT-F561	Studies in French Civilization	3
FRIT-F578	Contrastive Study of French and English	3
FRIT-F580	Applied French - Linguistics	3
FRIT-F603	History of the French Language 1	3
FRIT-F606	Capstone Project in French Teaching	3
FRIT-F632	Seventeenth-Century French Drama and Performance	3
FRIT-F635	Studies in Eighteenth-Century French Literature	3
FRIT-F640	Studies in Nineteenth-Century French Literature	3
FRIT-F651	Studies in French Cinema	3
FRIT-F667	Seminar in Francophone Studies	3
FRIT-F673	Topics in Learning and Teaching of French	3

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Master of Arts for Teachers in German is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 18 credit-hour [IU Online Graduate Certificate in German](#). All certificate coursework and credits stack into the 10 course/30 credit-hour M.A.T. in German
- Students who need to earn master's degree to become eligible to teach dual-credit German courses can apply directly to the IU Online M.A.T. in German.

Special Program Requirements

Admissions

To be accepted to this program, you must have:

- Bachelor's degree
- 3.0 minimum undergraduate GPA
- 20 credit hours in German coursework at the bachelor's level

To apply to this program, complete an online application that includes:

- Official transcripts from all colleges and universities attended
- 250-word personal statement explaining background and reasons for entering the program

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Summer 2 semester: Jun 15

Transfer Credit

Students who have earned credits from different accredited colleges or universities may transfer up to 3 credits.

Program Learning Outcomes

Program Goals: The Master of Arts for Teachers in German will foster:

- Expanded awareness of current methods in German language instruction,
- Increased cultural expertise,
- Enhanced German proficiency, and
- Deeper familiarity with the cultural canon and its problems.

Student Learning Outcomes

Students in the German component of the M.A.T. will:

- Survey the breadth of current scholarship on second language acquisition and identify opportunities to apply evidence-based strategies / pedagogies to improve learning in German language classes.

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

German (IU Online)

Contact Information

IU Online Academic Programs—iuoacad@iu.edu

Degrees Offered

Master of Arts for Teachers in German (IU Online)
Graduate Certificate in German (IU Online)

Master of Arts for Teachers in German Program Information

The IU Online Master of Arts for Teachers in German will expand your cultural knowledge and propel your teaching career. This flexible program focuses on both linguistic and cultural fluency, providing you with the knowledge and skills necessary to teach German effectively to your students in a variety of educational settings

- Demonstrate the cultural expertise required to confidently teach recent cultural developments in German speaking contexts across multiple genres and platforms such as literature, film, drama, and social media.
- Research and analyzed the ethical and political dimensions of historical and contemporary debates to students in German language classes.
- Explore connections between the German speaking community and the world.
- Develop strategies to improve facility in the German language by teaching the literary and popular-culture canons.

Students in the Graduate Education component of the M.A.T. will be able to:

- Analyze conceptions and definitions of curriculum and instruction, apply learning theories and schooling practices to deliver high quality introductory college-level courses, engage in the development of rigorous curriculum planning and design and promote skills and habits of mind that will contribute to academic success in college.
- Use assessment data to improve instructional practices and prepare dual-credit students for success in college-level assessments.
- Identify and deploy research-based strategies to address challenges and seize opportunities for teaching college-level material in pluralistic settings.
- Conduct basic educational research as it occurs in, and is applied to, practical, classroom settings and complete research projects to improve dual-credit

Degree Structure and Requirements

To earn the M.A.T. in German, students must complete six graduate courses in German and four graduate courses offered by the School of Education for 30 overall credit hours (18 credits in German and 12 credits in Education) and follow applicable Indiana University graduate policy.

Required Courses

Part I: M.A.T. Graduate German Component

Students must complete all six of the following courses:

- GER-T 510 Methods in German Instruction
- GER-T 520 Grammar and Writing
- GER-T 530 Film, Media, and Popular Culture
- GER-T 540 Germany and the U.S.
- GER-T 550 German Literature and Thought
- GER-T 560 Culture and Society

Part II: M.A.T. Graduate School of Education Component

Students must complete:

- EDUC-J 500 Instruction in the Context of the Curriculum
- EDUC-H 520 Education and Social Issues
- EDUC-P 507 Assessment in Schools
- EDUC-Y 520 Action Research

Timeline / Milestones

Working professional taking 3-4 courses per year will be able to complete the Master of Arts for Teachers in German in 2-3 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the M.A.T. German will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*.

Satisfactory Academic Progress

- 0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.
- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.
- The curriculum committee for the collaborative M.A.T. German will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the M.A.T.
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

GER-T 510 Methods in German Instruction	3
GER-T 520 Grammar and Writing	3
GER-T 530 Film, Media, and Popular Culture	3
GER-T 540 Germany and the U.S.	3
GER-T 550 German Literature and Thought	3
GER-T 560 Culture and Society	3
EDUC-J 500 Instruction in the Context of the Curriculum	3
EDUC-H 520 Education and Social Issues	3

EDUC-P 507 Assessment in 3
Schools

EDUC-Y 520 Action 3
Research

Graduate Certificate in German

Program Information

The IU Online Graduate Certificate in German will expand your cultural knowledge and propel your teaching career. This flexible program focuses on both linguistic and cultural fluency, providing you with the knowledge and skills necessary to teach German effectively to your students in a variety of educational settings

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Graduate Certificate in German is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 18 credit-hour IU Online Graduate Certificate in German.
- Students who need to earn master's degree to become eligible to teach dual-credit German courses can apply all GC German certificate coursework and credits towards satisfaction of requirements in the 10 course/30 credit-hour M.A.T. in German.

Students may choose to apply to either the GC German or [M.A.T. in German](#) depending upon their professional and educational goals and needs.

Special Program Requirements

Admissions

A bachelor's degree, including 20 hours of course work beyond first-year German, or equivalent demonstrated proficiency as determined by the program.

Admission Requirements

- Baccalaureate degree - transcripts from all colleges and universities attended (Transcripts not required from IU Campuses)
- 20 hours in German coursework at the bachelor's level
- Minimum 3.0/4.0 GPA in undergraduate.
- 250-word personal statement explaining background and reasons for entering the program. This statement should:
 - Reference career goals as they align with this program,
 - Describe relevant work experience, and
 - Briefly address any deficiencies in applicants academic record that do not meet program admission standards.

Application Dates

Fall semester: Aug 1
Spring semester: Jan 1
Summer 1 semester: May 1

Transfer Credit

Students who have earned credits from different accredited colleges or universities may transfer up to 3 credits.

Program Learning Outcomes

Program Goals: Students in the IU Online Graduate Certificate in German will learn to:

- Analyze the breadth of current scholarship on second language teaching and learning and apply evidence-based strategies / pedagogies to improve learning in German language classes.
- Create lesson plans developed with cultural expertise on recent cultural developments in German-speaking contexts across multiple genres and platforms.
- Analyze historical and contemporary cultural debates in the German-speaking world using appropriate materials.
- Critically examine the multidimensionality of the German-speaking world.
- Write and speak at advanced-low levels of German.

Degree Structure and Requirements

To complete the Graduate Certificate in German, students must complete 18 credit hours of coursework as follows:

1. GER-T 510 Methods in German Instruction (3 credits)
2. GER-T 520 Grammar and Writing (3 credits)
3. GER-T 530 Film, Media, and Popular Culture (3 credits)
4. GER-T 540 Germany and the U.S. (3 credits)
5. GER-T 550 German Literature and Thought (3 credits)
6. GER-T 560 Culture and Society (3 credits)

Timeline / Milestones

Working professional taking 3 courses per year will be able to complete the Graduate Certificate in German in 2 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the Graduate Certificate in German will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*.

Satisfactory Academic Progress

- 0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.
- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.
- The curriculum committee for the collaborative GRADUATE CERTIFICATE German will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the GRADUATE CERTIFICATE
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

GER-T 510 Methods in German Instruction	3
GER-T 520 Grammar and Writing	3
GER-T 530 Film, Media, and Popular Culture	3
GER-T 540 Germany and the U.S.	3
GER-T 550 German Literature and Thought	3
GER-T 560 Culture and Society	3

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

History (IU Online)

Programs Offered

Master of Arts in History (IU Online)
MAT in History (IU Online)
Graduate Certificate in History (IU Online)

Contact Information

IU Online Academic Programs— iuoacad@iu.edu

Master of Arts in History

Program Information

The IU Online Master of Arts in History studies both modern and pre-modern time periods to identify historical actors, events of significance, and social movements to better understand and communicate the importance of issues in our contemporary world. The fully online program combines flexibility with an extensive set of course options where students will gain graduate-level historical knowledge, critical thinking skills, and learn how to perform research and construct original historical

arguments. Students in the program will choose a regional area of focus and complete at least one semester-long research project of original scholarship.

Special Program Requirements

Admissions

To be accepted to this program, you must have:

1. A bachelor's degree
2. 3.0 minimum undergraduate GPA

To apply to this program, complete an online application that includes:

- Official transcripts
- 250-word personal statement explaining background and reasons for entering the program

Application Dates

Fall semester: Aug 1
Spring semester: Jan 1
Summer 1 semester: May 1
Summer 2 semester: Jun 15

Transfer Credit

Students who have earned credits from different accredited colleges or universities may petition the program faculty committee to review course materials to transfer up to 3 credits of graduate history coursework. Transfer credit is not automatic and subject to program review and approval.

Program Learning Outcomes

Students in the Master of Arts in History will learn to:

- Apply historical methods.
- Identify and describe broader historical context.
- Explain historiographic trends.
- Connect historical events/issues to contemporary situations.
- Locate and identify primary source material (written, visual, material, culture, artistic, oral, photographic, video, digital)
- Locate and identify secondary source material.
- Employ appropriate academic style and citations.
- Identify and use appropriate digital tools for historical research.
- Assess validity of historical sources.
- Analyze historical sources to develop and support an argument.
- Produce article-length original research papers and projects.
- Identify and employ the methods and theories of digital and public history.
- Evaluate and use public and digital history methods and tools for use with a public audience.

Degree Structure and Requirements

To earn the IU collaborative MA in History, students must complete 10 graduate History courses for a total of 30 credits and satisfy the following core and distribution requirements:

Historical Methodology (3 Cr)

- HIST-T 510 Historical Methodology

Digital and Public History (3 Cr)

- HIST-T 570 Digital and Public History

One four-course major field (12 Cr)

The collaborative MA in History offers two major options—U.S. History or World History

Option one: U.S. History (complete 4 of 5)

- HIST-T 520 Teaching College History
- HIST-T 530 Early America, 1400-1800
- HIST-T 540 The Long 19th Century, 1800-1917
- HIST-T 550 Modern United States, 1917-Present
- HIST-T 560 US and the World –Comparative History

Option Two: World History (complete 4 of 5)

- HIST-T531 European History
- HIST-T541 Latin American History
- HIST-T551 Asian History
- HIST-T 561 African History (in development)
- HIST-T571 World History

Students in the World History major may repeat any one of the major courses once for credit provided the repeated course has a different topic. Students cannot count a third enrolment in a particular course in the MA History (even if all three versions have different topics). This ensures that students cover at least two regions when completing the World History major.

Minor Field (6 cr)

- Two courses chosen from the list of courses listed for the other major.

Historical Research (3 Cr)

- HIST-T 590 Research Seminar in History

MA History Capstone (3 Cr)

Students complete one of the following three options:

- HIST-T 590 Research Seminar in History—Students produce an additional semester-long research project on a topic of the student's own choosing in consultation with the instructor of record that will culminate in an article-length work (8,000 to 10,000 words excluding notes and bibliography) of original scholarship based on primary and secondary sources.
- HIST-T 591 Research Seminar in Digital and Public History P: T570 Digital and Public History. Students produce a digital or public history project based in original scholarship.
- HIST-T 592 Thesis Students produce a thesis length research project that builds on a previous paper and is based on original scholarship. The outcome will be at least 40 pages in length.

Timeline / Milestones

Working professionals taking 2-4 courses per year will be able to complete the Master of Arts in History in 1-2 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the M.A. History will follow University Graduate School policy as published in

University Graduate School Bulletin and Graduate Handbook.

Satisfactory Academic Progress

- 0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.
- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.
- The curriculum committee for the collaborative M.A. History will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the M.A.T.
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

HIST-T500	Topics in History	3
HIST-T510	Historical Methodology	3
HIST-T520	Teaching College History	3
HIST-T530	Early America, 1400-1800	3
HIST-T531	European History	3
HIST-T540	The Long 19th Century, 1800-1917	3
HIST-T541	Latin American History	3
HIST-T550	Modern United States, 1917-Present	3
HIST-T551	Asian History	3
HIST-T560	US and the World – Comparative History	3
HIST-T561	African History	3
HIST-T570	Digital and Public History	3

HIST-T571	World History	3
HIST-T590	Research Seminar in History	3
HIST-T591	Research Seminar in Digital and Public History	3

Master of Arts for Teachers in History (IU Online)

Program Information

The IU Online Master of Arts for Teachers in History will develop a breadth of knowledge in historical subjects and master teaching methods appropriate for college-level history courses. In this flexible online program, you'll take courses in education and history and prepare to be an instructor at the high school and college levels. Students in the M.A.T. History will choose a historical area of focus where they will learn to perform historical research, construct original arguments, and analyze current and past events to refine their pedagogical skills and knowledge.

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Master of Arts for Teachers in History is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 18 credit-hour [IU Online Graduate Certificate in History](#). All certificate coursework and credits stack into the 10 course/30 credit-hour M.A.T. in History.
- Students who need to earn master's degree to become eligible to teach dual-credit History courses can apply directly to the IU Online M.A.T. in History.

Special Program Requirements

Admissions

To be accepted to this program, you must have:

- Bachelor's degree
- 3.0 minimum undergraduate GPA

Admission to the M.A.T. History routes through the Graduate Certificate in History. Students become eligible for entry into the M.A.T. History students must complete two GC History courses with B or higher grades (3.0 GPA).

To apply to the Graduate Certificate in History, complete an online application that includes:

- Official transcripts from all colleges and universities attended

- 250-word personal statement explaining background and reasons for entering the program

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Summer 2 semester: Jun 15

Transfer Credit

Students who have earned credits from different accredited colleges or universities may petition the program faculty committee to review course materials to transfer up to 3 credits of graduate history coursework.

Transfer credit is not automatic and subject to program review and approval.

Program Learning Outcomes

Program Goals: Students in the Master of Arts for Teachers in History will:

- Apply historical methods.
- Identify and describe broader historical context.
- Explain historiographic trends.
- Connect historical events/issues to contemporary situations.
- Locate and identify primary source material (written, visual, material culture, artistic, oral, photographic, video, digital).
- Locate and identify secondary source material.
- Employ appropriate academic style and citations.
- Identify and use appropriate digital tools for historical research.
- Assess validity of historical sources.
- Analyze historical sources to develop and support an argument. canon and its problems.

Student Learning Outcomes

Students in the History component of the M.A.T. will:

- Survey the breadth of current scholarship on second language acquisition and identify opportunities to apply evidence-based strategies / pedagogies to improve learning in History language classes.
- Demonstrate the cultural expertise required to confidently teach recent cultural developments in History speaking contexts across multiple genres and platforms such as literature, film, drama, and social media.
- Research and analyzed the ethical and political dimensions of historical and contemporary debates to students in History language classes.
- Explore connections between the History speaking community and the world.
- Develop strategies to improve facility in the History language by teaching the literary and popular-culture canons.
- Evaluate teaching methods against collegiate learning outcomes
- Selecting sources and preparing lessons
- Provide formative feedback on college-level lessons & assessments and integrate feedback.

Students in the Graduate Education component of the M.A.T. will be able to:

- Analyze conceptions and definitions of curriculum and instruction, apply learning theories and schooling practices to deliver high quality introductory college-level courses, engage in the development of rigorous curriculum planning and design and promote skills and habits of mind that will contribute to academic success in college.
- Use assessment data to improve instructional practices and prepare dual-credit students for success in college-level assessments.
- Identify and deploy research-based strategies to address challenges and seize opportunities for teaching college-level material in pluralistic settings.
- Conduct basic educational research as it occurs in, and is applied to, practical, classroom settings and complete research projects to improve dual-credit

Degree Structure and Requirements

To earn the Master of Arts for Teachers in History, students must complete the graduate history and graduate education degree components for a total of 30 credits.

MAT History –(identical to the GC History)

S. History (15 cr)

b. MAT History core

Complete five courses selected from the following list:

- HIST-T 510 Historical Methodology (3 cr)
- HIST-T 520 Teaching College History (3 cr)
- HIST-T 530#Early America, 1400-1800 (3 cr)
- HIST-T 540#The Long 19th Century, 1800-1917 (3 cr)
- HIST-T 550#Modern United States, 1917-Present (3 cr)
- HIST-T 560 US and the World – Comparative History (3 cr)
 - c. History Capstone (3 cr)
- HIST-T 590#Research Seminar in History (3 cr)
 - Education Component (12 cr)

Complete the following four School of Education graduate classes:

- EDUC-H 520 Education and Social Issues
- EDUC-J 500 Instruction in the Context of Curriculum
- EDUC-P 507 Assessment in Schools
- EDUC-Y 520 Strategies for Educational Inquiry

Timeline / Milestones

Working professionals taking 3-4 courses per year will be able to complete the Master of Arts for Teachers in History in 2-3 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the M.A.T. History will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*.

Satisfactory Academic Progress

- 3.0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.

- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.
- The curriculum committee for the collaborative M.A.T. History will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the M.A.T.
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

HIST-T500	Topics in History	3
HIST-T510	Historical Methodology	3
HIST-T520	Teaching College History	3
HIST-T530	Early America, 1400-1800	3
HIST-T531	European History	3
HIST-T540	The Long 19th Century, 1800-1917	3
HIST-T541	Latin American History	3
HIST-T550	Modern United States, 1917-Present	3
HIST-T551	Asian History	3
HIST-T560	US and the World – Comparative History	3
HIST-T561	African History	3
HIST-T570	Digital and Public History	3
HIST-T571	World History	3
HIST-T590	Research Seminar in History	3
HIST-T591	Research Seminar in Digital and Public History	3

Graduate Certificate in History

The IU Online Graduate Certificate in History will expand your cultural knowledge and propel your teaching career. This flexible program focuses on both linguistic and cultural fluency, providing you with the knowledge and skills necessary to teach History effectively to your students in a variety of educational settings.

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Graduate Certificate in History is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 18 credit-hour IU Online Graduate Certificate in History.
- Students who need to earn master's degree to become eligible to teach dual-credit History courses can apply all GC History certificate coursework and credits towards satisfaction of requirements in the 10 course/30 credit-hour M.A.T. in History.

Students interested in graduate study in history may choose to apply to either the GC History, [M.A.T. in History](#), or the Master of Arts in History depending upon their professional and educational goals and needs.

Special Program Requirements

Admissions

To be accepted to this program, you must have:

1. A bachelor's degree
2. 3.0 GPA or above on a 4.0 scale

To apply to this program, complete an online application that includes:

- Official transcripts from each undergraduate institution
- 250-word personal statement explaining background and reasons for entering the program

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Transfer Credit

Students who have earned credits from different accredited colleges or universities may transfer up to 3 credits.

Program Learning Outcomes

Students in the IU Online Graduate Certificate in History will learn to:

- Apply historical methods.
- Identify and describe broader historical context.
- Explain historiographic trends.
- Connect historical events/issues to contemporary situations.

- Locate and identify primary source material (written, visual, material, culture, artistic, oral, photographic, video, digital)
- Locate and identify secondary source material.
- Employ appropriate academic style and citations.
- Identify and use appropriate digital tools for historical research.
- Assess validity of historical sources.
- Analyze historical sources to develop and support an argument.
- Evaluate teaching methods against collegiate learning outcomes.
- Select sources and prepare lessons.
- Provide formative feedback on college-level lessons and assessments and integrate feedback.
- Analyze the breadth of current scholarship on second language teaching and.

Degree Structure and Requirements

To earn the Graduate Certificate in History, students must complete six courses for 18 credits.

1. **Graduate Certificate in History**
2. **Graduate U.S. History (15 cr)**

Complete five courses selected from the following list:

- HIST-T 510 Historical Methodology (3 cr)
- HIST-T 520 Teaching College History (3 cr)
- HIST-T 530 Early America, 1400-1800 (3 cr)
- HIST-T 540 The Long 19th Century, 1800-1917 (3 cr)
- HIST-T 550 Modern United States, 1917-Present (3 cr)
- HIST-T 560 US and the World – Comparative History (3 cr)

History Capstone (3 cr)

- HIST-T 590 Research Seminar in History (3 cr)

Timeline / Milestones

Working professionals taking 3 courses per year will be able to complete the Graduate Certificate in History in 2 years of consecutive or part-time enrollment.

Satisfactory Academic Progress and Dismissal

Academic policies for the Graduate Certificate in History will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*.

Satisfactory Academic Progress

- 0 GPA required for good standing.
- Any semester's work averaging less than B will result in the student being placed on academic probation.
- Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The program evaluates each student's progress toward the degree every year.

Dismissal and Re-Entry

- Dismissed students must sit out at least one semester.

- The curriculum committee for the collaborative Graduate Certificate in History will work with the appropriate administrators at the student's campus of enrollment to evaluate the student's eligibility to resume work on the Graduate Certificate
- Students may be required to submit a readmission petition or otherwise demonstrate that they have taken steps to address the underlying issues negatively impacting their academic performance.
- Readmission decisions will occur on a rolling basis.
- Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses and Credits

Course # and Title	Credits
HIST-T 510 Historical Methodology	3
HIST-T 520 Teaching College History	3
HIST-T 530 Early America, 1400-1800	3
HIST-T 540 The Long 19 th Century, 1800-1917	3
HIST-T 550 Modern United States, 1917-Present	3
HIST-T 560 US and the World – Comparative History	3
HIST-T 590 Research Seminar in History	3

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).

Addiction Neuroscience

Addiction Neuroscience

Degree Offered

Graduate Certificate in Literature (IU Online)

Contact Information

IU Online Academic Programs— iuoacad@iu.edu

Degree Offered

Graduate Certificate in Literature (IU Online)

Program Information

The fully online IU Online Graduate Certificate in Literature focuses on current literary debates and theories of instruction to create reading and literary analysis strategies for students in English Literature courses.

Of Special Interest for Teachers/Instructors Needing to Meet HLC Dual-Credit Standards

The Graduate Certificate in Literature is ideal for teachers who need to meet Higher Learning Commission (HLC) faculty qualification standards to become eligible to teach dual-credit courses. To meet the standards, a dual-credit instructor must hold either a master's degree in their area of instruction or a master's degree in another discipline (such as education), plus at least 18 credit hours of discipline-specific graduate coursework.

- If you hold a master's degree in another discipline, you can meet HLC standards by completing the 20-credit hour Graduate Certificate in Literature.
- If you plan to pursue the [IU Online M.A. in English](#), you may apply the 20 credit hours from the Graduate Certificate in Literature toward the master's degree.

Special Program Requirements

To be accepted to this program, you must have:

1. A bachelor's degree
To enroll in this program, you must possess either a B.A. in English (or related bachelor's degree in education with an English specialization, concentration, or outside area) or two years of secondary teaching experience in literature or composition
2. 3.0 GPA or above on a 4.0 scale

To apply to this program:

Complete an online application that includes:

- Transcripts
- A 250-word personal statement explaining your background and reasons for entering the program
- TOEFL scores (international students only)

Application Dates

Fall semester: Aug 1

Spring semester: Jan 1

Summer 1 semester: May 1

Summer 2 semester: Jun 15

Certificate Course Requirements

To earn the Graduate Certificate in Literature, students must complete five graduate English courses for 20 credits.

Requirements

Course Requirements

1. Complete the following:
 - ENG-W 503 Teaching of Literature in College
 - ENG-W 553 Studies in Literature
2. History of the English language

Complete one of the following:

- ENG-L 625 Readings in Shakespeare
- ENG-L 639 English Fiction to 1800
- ENG-L 641 English Literature 1760-1900
- ENG-L 660 Studies in British and American Literature
- ENG-L 681 Genre Studies

Complete one of the following:

- ENG-D 600 History of the English Language
- ENG-G 655 History of the English Language

3. Certificate Elective:

Complete one additional course in English Literature (ENG-L 500/600)

Timeline / Milestones

- **Transfer Credit**

Transfer credit, satisfactory academic progress, and dismissal from the certificate program will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*. Current policy is as follows:

Transfer Credit: With the approval of the steering committee and in accordance with pertinent IU policies, students may transfer in one four- credit course in partial satisfaction of certificate requirements. No course may be transferred from another institution unless the grade is a B or higher.

Satisfactory Academic Progress and Dismissal

3.0 GPA required for good standing. Any semester's work averaging less than B will result in the student being placed on academic probation. Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The department evaluates each student's progress toward the degree every year.

Dismissed students must sit out at least one semester. The curriculum committee will read petitions from students seeking re-entry on a rolling basis. The committee will look for evidence that the student has addressed the underlying issues and obstacles to academic success. Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment.

Courses

Course Number and Title	Credits
ENG-W 503 Teaching of Literature in College	4
ENG-W 553 Studies in Literature	4
ENG-L 625 Readings in Shakespeare	4
ENG-L639 English Fiction to 1800	4
ENG-L 641 English Literature 1760-1900	4
ENG-L 660 Studies in British and American Literature	4
ENG-L 681 Genre Studies	4
ENG-D 600/G655 History of the English Language	4

Electives

ENG-L 5XX / ENG-L 6XX 4
Any ENG-L or advisor-approved course

Faculty Listings

A list of graduate faculty is available on the [Faculty Member website](#).