



JOHNS HOPKINS
ENVIRONMENTAL HEALTH
& ENGINEERING

Graduate Student Handbook

2020-21

ehe.jhu.edu

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Note: For the latest guidance and information regarding campus operations and activities, please visit the Johns Hopkins Coronavirus Information page <https://covidinfo.jhu.edu/>.

1 INFORMATION

1.1 CONTACTS

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1.2 EHESO

EHESO is the departmental student organization formed for the purpose of facilitating social, intellectual, and service-oriented interaction between students, staff, and faculty of the Department of Environmental Health and Engineering. EHESO unites students from the different disciplines of the Department and provides a forum for students to voice their concerns and share ideas and research. Networking opportunities, social events, student-sponsored conferences, and lectures are all benefits of EHESO. For further information, please contact JHSPH.EHESO@jhu.edu, visit the [EHESO webpage](#), or EHESO Facebook page.

2020-21 BOARD MEMBERS

Emily Illingworth <i>President</i>	Nicole Taube <i>President-Elect</i>
Monica Lee <i>Secretary</i>	Emma Moynihan <i>Treasurer</i>
Haley Garbus <i>JHSPH Student Assembly Representative</i>	Esther Xu <i>WSE PhD Representative</i>
Elsie Moore <i>Research Committee Representative</i>	Kelsey Babik <i>Educational Programs Committee Representative</i>
Kaitlin Waite <i>Postdoc Representative</i>	Carolyn Gigot & Maureen Malloy <i>Doctoral Student Council Representatives</i>
Jordan Kuiper <i>Sustainability Council Representative</i>	Alan Kim <i>JHSPH Master's Representative</i>
Katie Phipps <i>Staff Officer</i>	

1.3 POLICIES

1.3.1 Accounts

Students should monitor their SIS account on a monthly basis so that problems may be resolved in a timely manner. The Department may deposit funds for tuition and certain fees into accounts, but the student is responsible for charges related to expenses that are not covered by the Department. These charges include late registration fees, even when the Department pays for tuition costs. For additional information see [WSE Student Accounts](#) and [JHSPH Student Accounts](#).

1.3.2 Leave of Absence

Academic leave of absence refers to, and is limited to, students in a degree program requiring continuous enrollment who, while in good academic standing, are forced to withdraw temporarily from graduate work due to paternal/family leave or reasons beyond their control, such as illness, military service, or pressing personal reasons justifying an interruption of the degree program. Students may be given a leave of absence for other reasons (e.g. involuntary, medical leave).

Leaves of absence are typically limited to one year except for military service. Students requiring additional terms of leave beyond the one year must reapply. Students who have had federal financial

aid may be subject to additional restrictions and should check with the Financial Aid Office before extending a leave of absence. No more than two years of leave may be granted.

If it becomes necessary to take a break from studies, students should contact their adviser and academic program administrator to determine if a formal leave of absence (LOA) is necessary. Any request for change of status must be discussed with the program or track director(s) and academic program administrator and approved by the department and school.

SPH students - https://www.jhsph.edu/offices-and-services/student-affairs/resources/student-policies/documents/Academic_Leave_of_Absence.pdf

WSE students - <https://homewoodgrad.jhu.edu/academics/graduate-board/enrollment-status-change-forms/>

1.3.3 International Travel

The following policy applies to students enrolled in JHSPH. The Whiting School of Engineering does not have a formal travel policy; however, resources and recommendations are offered. Students enrolled in WSE should check the [Travel Resources page](#) provided by the Office of Graduate and Postdoctoral Affairs.

As a graduate student at the Johns Hopkins Bloomberg School of Public Health, you may have an opportunity to supplement your education or conduct research in another country. These opportunities often enrich the academic curriculum, contribute to dissertation research, and allow you to apply the knowledge you obtain in the classroom to the world's communities. While the School encourages participation in these kinds of experiences, international tensions can be high and the resources on the [international travel website](#) are provided to assist you in making an informed decision.

Students are not obligated to travel internationally, and each student has the right to decline to travel abroad. If the student is supported by a research project that requires such travel and the student chooses not to travel, the student may be removed from that project following discussions with the principal investigator and the EHE program or track directors.

Graduate students who decide to travel abroad must demonstrate that they understand and voluntarily accept the risks inherent in international travel. To do so, students must first receive the appropriate departmental approvals for the trip through their adviser and program or track director(s). Once approved, students must complete the following steps:

1. Review the [JHSPH Student Travel Handbook](#) and student-related information on the [JHSPH International Travel site](#).
2. Consult the Department of State website at <http://travel.state.gov>. Information on U.S. embassies, [travel advisories](#), and the availability of transportation should the situation in a country deteriorate may be found on this site.
3. Register your travels with the [JHU International Travel Registry](#).

4. Complete the [International Travel Checklist](#) and [Graduate Student Study Release form](#). Submit both documents to the academic program administrator at least one week in advance of your proposed travel date.

Immunizations - If you are traveling to a less developed part of the world, you should be certain to contact your health care provider or the Johns Hopkins International Travel clinic to learn about recommended immunizations and other matters to guard your health. Located on the East Baltimore campus, you can reach the [International Travel Clinic](#) by telephone at 410-955-8931.

Stay Informed - Students are encouraged to vigilantly monitor consular and press reports regarding the country (or countries) where they plan to travel. Students may also check the consular reports of countries friendly to the U.S. (e.g., [Australia](#), [Canada](#), [United Kingdom](#)) as well as reports from other international agencies (e.g., United Nations). Students should participate in the security briefings offered by other organizations with whom they may be working.

Maintain Communication - When traveling in an area where regular communication is difficult, students are encouraged to maintain contact with their adviser and/or the academic program administrator.

State Department Registration - For students who are likely to stay for a prolonged period in a high-risk area of the world, registration at the U.S. embassy or consulate is essential.

International Students - International students must contact the Office of International Services (OIS) well in advance of any travel to avoid compliance issues with their visa status. OIS may also be contacted at 410-955-3371.

Healix International - Johns Hopkins has implemented a comprehensive travel assistance program supported by Healix International. Healix International provides medical or security assistance during university-related travel. For more information visit the [JHSPH International Travel Resources](#) page.

1.3.4 Parental Accommodations

Full-time graduate students and full-time postdoctoral fellows may request from their school a [“new child accommodation”](#) for 8 weeks. A new child accommodation is designed to make it possible to maintain the parent’s existing status, and to facilitate their return to full participation in classwork, research, teaching, and clinical training in a seamless manner.

Eligible graduate students who plan to utilize a new child accommodation are expected to notify the Chair of the department/program or designated faculty or staff member as soon as the student is aware of the need to use a new child accommodation to facilitate appropriate scheduling. This should ideally be at least 90 days before the proposed start date of the new child accommodation.

1.3.5 Personal Relationships

The Johns Hopkins University is committed to the personal, academic, and professional well-being and development of its students, trainees, faculty, staff, postdoctoral fellows, clinical residents, and all other members of the University community. The University seeks to maintain an atmosphere of mutual respect, collegiality, fairness, and trust. The [Personal Relationships Policy](#) implements the University’s commitment to maintaining the integrity of its educational and working environment. This policy focuses on the conflict of interest that may exist when individuals simultaneously engage in both

personal and professional relationships in which one individual has the potential to exert substantial academic or professional influence over the other. The full policy is found [here](#).

1.4 HEALTH AND WELL-BEING RESOURCES

Johns Hopkins University is committed to helping you thrive personally and professionally and providing an environment that supports your health and well-being. We encourage you to seek support from the following JHU resources, particularly if you are experiencing anxiety, stress, depression, or other concerns related to your health and well-being.

Information for students enrolled in JHSPH:

[The Office of Student Life at JHSPH](#) is available to assist students by providing support in navigating resources pertaining to personal and academic challenges. If you would like to schedule a one-on-one appointment with a staff member in the Office of Student Life, you can contact jhsph-studentlife@jhu.edu or 410-502-2487.

Students can also contact the [Johns Hopkins Student Assistance Program](#) (JHSAP) which provides resources to assist students across the Johns Hopkins community with any pressures and difficulties they may face during their academic careers. Getting help is free, convenient, and confidential. Counselors are available to speak with you 24 hours a day, 7 days a week at 443-287-7000. Services include: Short-term counseling, crisis response, healthy relationship support, school-life coaching and adjustment and educational workshops.

Students have access to [University Health Services](#) (UHS) which offers primary care and mental health clinical services. Primary care appointments can be made by calling 410-955-3250. UHS-Mental Health provides psychiatric assessment and follow-up, medication management and individual psychotherapy. To make an appointment, call 410-955-1892.

If you or someone you know is in crisis, call JHSAP at 443-287-7000 for help immediately. In an emergency, call 911 or go to the nearest emergency room.

Information for students enrolled in WSE:

The [Office of Graduate Academic Affairs](#) serves the master's, doctoral, and post-doctoral communities of WSE and provides the support, resources, and information students need to succeed at the Whiting School. To make an appointment to discuss a personal or academic challenge, please reach out to Allison Leventhal, Outreach and Support Case Manager, aleventhal@jhu.edu, 410-516-2328, or to Christine Kavanagh, Assistant Dean for Graduate and Postdoctoral Academic Affairs, christinekavanagh@jhu.edu, 410-516-0777.

Additional resources are available through the [Homewood Counseling Center](#). If you are feeling overwhelmed and stress is impacting your mental health, you may contact the Counseling Center for safe and confidential services. Students have a wide variety of services available including, workshops, group therapy, medication management, psychiatric assessment, and 24/7 crisis intervention services.

All counseling services are offered free of charge to students. Please contact the Counseling Center at 410-516-8278. To reach an after-hours on-call counselor, call 410-516-8278 and press “1”.

WSE students can seek medical attention and health care services through the [Student Health and Wellness Center](#). Services include acute and chronic illness care, alcohol and other drug problem assessments, allergy injections, international travel consults and immunizations, physical exams and routine immunizations. Please contact the center at 410-516-8270.

Information for all students:

The [Office of Student Health and Well-Being](#) maintains a list of resources for students and fellows across Hopkins campuses.

International students are encouraged to take advantage of all the various health and wellness resources for JHU international students. Additional information is available at a [newly-launched website](#).

Students in need of support regarding sexual assault and/ or sexual violence can find resources and information on the University's [Sexual Assault Response and Prevention webpage](#).

[University Policies and Statements](#)

This is a resource for all university-level policies, statements, and guidelines. It is password protected, be prepared to sign in with your JHED ID.

2 PHD PROGRAM

The Department of Environmental Health and Engineering houses two PhD programs:

- PhD in Environmental Health
 - Within the PhD in Environmental Health there are two tracks that students may follow: Exposure Sciences and Environmental Epidemiology (ESEE) and Toxicology, Physiology, and Molecular Mechanisms (TPMM).
- PhD in Geography and Environmental Engineering

All EHE doctoral students are required to complete the following courses as foundation curriculum:

- EN.570.616 Data Analytics in Environmental Health and Engineering
- Advanced Environmental Health I (term 3)
- Advanced Environmental Health II (term 4)

In addition to attendance at formal courses, students are required to attend department seminars. These seminars may vary depending on program; however, all doctoral students must register for and attend the EHE Student Seminar and Grand Rounds (PH.180.860) where students will attend and present (once per year in years 2-4) their ongoing research.

Additionally, each program and track has specific policies and requirements. If the student is unsure of their programmatic requirements, it is their responsibility to contact their adviser and academic program administrator for clarification.

PhD students are encouraged to review the graduate and professional education resources available on the JHU website: <https://provost.jhu.edu/education/graduate-and-professional-education/>

2.1 PHD PROGRAM POLICIES

2.1.1 Vacation

Students will take no more than two weeks' vacation per academic year (University holidays are approved time off and are not included in the two weeks' vacation). Students must discuss all plans for vacation or other absences with their adviser. Non-compliance with the vacation policy is grounds for probation or dismissal from the program.

2.1.2 Attendance

Students are required to attend all classes, including journal clubs and seminars, and actively participate. Scheduling conflicts that arise must be discussed with the student's adviser. Since research and practice are fundamental parts of the curriculum, it is required that students will work (with the approval of their adviser) in the laboratory, or pursue other research, including participation in public health practice opportunities during semester or term breaks. Non-compliance with the attendance policy is grounds for probation or dismissal from the program.

2.1.3 Assessment of Progress

In order to monitor and document adequate academic performance and progress, a review of the doctoral student's grades and activities is carried out continually. This information is reviewed by the adviser, the doctoral track directors and the academic program administrator. In addition to maintaining satisfactory academic progress and being in good standing with departmental standards, each student must successfully complete a comprehensive written examination, departmental practice oral evaluation, and the school-wide preliminary oral examination. Failure to successfully complete any of these requirements will be grounds for dismissal from the program.

2.2 INDIVIDUAL DEVELOPMENT PLAN (IDP)

The University Doctoral Board requires that each doctoral student will be reviewed annually during each year of their doctoral program. This requirement is also in line with a 2014 National Institutes of Health (NIH) notice strongly encouraging the development of an institutional policy on Individual Development Plans (IDPs) for all graduate students supported by NIH funds.

The IDP addresses two needs. First, it provides a structure to systematically identify training needs and competencies, establish goals and take stock of year-by-year progress. Thus, IDPs help doctoral students stay on track with their research as well as paper and grant writing and skills development. Second, there are many career options for individuals who have obtained a PhD in Environmental Health. The IDP helps doctoral students plan and prepare for their post-PhD future. In both areas, IDPs can serve as a tool to facilitate communication between trainees and their mentors.

Goals and Benefits

An annual IDP as part of a broader mentoring program will give the trainee a framework for self-assessment, planning, and communication:

- Assessing current skills, interests, and strengths and their progress in the program;
- Establishing target dates for academic and research milestones
- Developing a plan for skill development to meet academic and professional goals;
- Set goals and sub-goals for the next year, including how to spend their time
- Defining in detail the approach they plan to take in order to obtain the specific skills and strengths needed (e.g. courses, technical skills, teaching, supervision) along with an anticipated time frame for obtaining those skills and strengths
- Helping define career goals and create annual plans to reach goals
- Providing a tool that can be used to provide structure for conversations between the student and their mentor
- Communicating and collaborating with colleagues and potential employers about evolving goals and related skills
- Using the IDP to make sure student and adviser expectations are clearly outlined and in agreement so that there are no big surprises, particularly towards the end of doctoral training
- The IDP is meant as a living document, to be modified as the student moves through the program to help solidify goals and plans

Students are encouraged to take advantage of this opportunity to reflect on their success and challenges from the previous year and work towards key milestones and anticipate challenges in the coming year(s). They are encouraged to use the questions in the IDP as a starting place for thinking; they should not feel the need to respond to all questions, if some are less relevant for the individual, and the student should feel free to also consider addressing other aspects not included in the structured IDP questions.

IDP and Annual Review Components

The annual review will have three components:

1. Student self-assessment and IDP
2. Monitoring of progress in the program
3. Written feedback from the department to the student

Student Self-Assessment and IDP

At the start of each academic year students will complete or update the self-assessment and IDP. They will meet with their adviser in person to discuss the IDP no later than the end of 1st semester/2nd term (December 23, 2020). If insufficient progress is being made (e.g. failing grades, inadequate progress), the student may be placed on probation prior to the start of the 2nd semester/3rd term.

Students in the second year and beyond will document their accomplishments from the past year and note specifically any accomplishment(s) and activities not presently reported (i.e. papers in review/published, posters presented, presentations or guest lectures given, and/or grant proposals in progress, submitted or funded). Students should note if they had any teaching assistant (TA) duties.

Students should include short- and long-term research/academic/professional goals, for the next year and beyond, how their progress in the past year has contributed to those goals, how their planned activities in the next year will contribute to their longer-term goals, and any impediments they see to reaching those goals.

Students should note issues that could impede their progress in the program or in terms of their broader professional goals. Students should also identify and discuss new activities and opportunities that could assist them in achieving their goals.

Monitoring student progress in the program

If the student has not completed their qualifying written and oral exams, then the student will schedule an in-person meeting with their adviser and another faculty member, if desired (e.g. co-adviser or track director), to review the IDP. If the student has completed their qualifying written and oral exams, then this meeting will be done in conjunction with a thesis advisory committee meeting.

There should be mention of a timeline for meeting program goals and degree completion; and any concern regarding performance. Funding, research changes, TA expectations, etc. should be confirmed and clarified as well. Concerns, questions and needed clarifications should be addressed in this meeting. If there are irreconcilable concerns between the student and adviser, the track directors should be consulted with next steps potentially engaging the Departmental chair in the discussions.

After the meeting the student will write a brief summary of their goals and plans for the next year and send it to their adviser for their comments and feedback. The completed form is then emailed to the academic program administrator as documentation that the IDP was completed and discussed between student and adviser.

Students who have successfully passed the School-wide preliminary oral exam will meet with their thesis advisory committee every six months until program completion. A report of each meeting will be documented on Form C- Thesis Advisory Committee Meeting Evaluation and submitted to the academic program administrator to be included in the students file.

Departmental feedback to the student

Each year the Department will provide written feedback to the student. Feedback will be in the form of a letter detailing the student's progress and deficiencies, evidence of completion of the IDP process and discussion, and summary of specific goals and expectations for the next year. Students will receive this feedback by August 1.

If a student has not made satisfactory progress in meeting program requirements or expectations, this checkpoint will be an opportunity to place them on probation. Any probation will be outlined in a separate letter with clear terms and deadlines.

Reporting and Records

The Department is responsible for initiating the IDP/annual review process and ensuring its completion even if a student or adviser does not comply or engage in the process.

If a student does not respond to requests to participate in the annual review process, a note will be placed with the Department's tracking system citing that the student did not comply. Non-compliance will result in probation.

In the event the adviser is unable or unwilling to complete the annual review process the department will select another faculty member to complete the review. The Department chair will discuss the implications of non-compliance of faculty mentors with the IDP process.

To assure appropriate confidentiality, there will be no mention of a student's mental or physical health or reporting on any other student in any student IDP documentation created by the department/adviser/committee.

2.3 PHD IN ENVIRONMENTAL HEALTH

Academic Program Administrator: Katie Phipps, MSED

Students in the PhD program select from two tracks: Exposure Sciences and Environmental Epidemiology (ESEE), or Toxicology, Physiology, and Molecular Mechanisms (TPMM).

Through core and track-specific courses, research rotations, qualifying examinations, and mentored research, the goal of PhD training in EHE is to prepare graduates to be independent investigators who engage in scholarship that creates new knowledge, use research to transform practice and improve environmental health, and effectively communicate research findings.

We expect graduates of the program to be able to:

1. Describe all aspects of the environmental health paradigm (from sources to health effects) for a range of agents and stressors and scales from local to global
2. Identify common environmental health hazards and risks
3. Understand the interdisciplinary nature of environmental health research
4. Explain core epidemiological concepts
5. Explain the role of law, policy and regulations in environmental health protection
6. Explain concepts of risk assessment and management to assess and control environmental health risks
7. Utilize statistical techniques to support research designs and perform data analyses
8. Write and critique a grant proposal in the National Institutes of Health (NIH) format
9. Evaluate and critique a body of literature in order to assess the state of knowledge and research gaps
10. Develop a specialized area of knowledge within one of the Department's academic tracks

11. Develop a set of research tools and skills needed to conduct independent research
12. Develop, conduct and defend original research that is worthy of publication and leads to a completed thesis
13. Communicate research results to technical and lay audiences
14. Translate research findings into practice

2.3.1 Policies

In addition to program- and department-level policies, students are responsible for following [School-](#) and [University-level policies](#).

2.3.1.1 Financial Support

The Department offers several predoctoral and postdoctoral fellowship opportunities for U.S. citizens and U.S. permanent residents which are sponsored by various training grants including those funded by the National Institutes of Health (NIH), the National Institute for Occupational Safety and Health (NIOSH) and private foundations. Support from these grants includes tuition, stipend, and health insurance for selected applicants. Travel funds available from the T32 training grant are limited to \$300 for predoctoral students and \$600 for postdoctoral fellows. Please contact the academic program administrator for information.

All qualified applicants are considered for scholarship opportunities. Please note that funding for non-U.S. citizens is very limited. The allocation process is very competitive and funding sources vary each year. In most cases, admitted students will be notified at the time of acceptance if they are awarded any type of financial support with the amount and type of support specified in the award notification. Students should contact the EHE Business Office if they have any questions about their award or accounts. Students are encouraged to visit the School's website for [funding opportunities](#) and [funding resources](#).

2.3.1.2 Faculty Advisers

In the ESEE track, PhD students are assigned a faculty adviser once they are admitted to the program. The adviser serves as the primary contact for the Department and will assist the student with course selection each term, planning research rotations if appropriate, preparation of journal club and seminar presentations, and the interpretation of Departmental and School policies.

In the TPMM track, students are assigned an academic advisor that serves in this role. This initial, academic, adviser may or may not become the student's research adviser. As early as the first year, students in the TPMM track will identify a thesis research adviser to serve as the student's adviser for the conduct of their research.

In both tracks, the identification of a primary faculty advisor does not exclude significant interactions with other members of the faculty. The faculty adviser must approve student registration and course plans (as applicable). At the end of each academic year, the adviser and the student must review academic progress and determine plans that will keep the student on track towards graduation. This information is also reviewed by the student's doctoral track director(s) and the academic program administrator. If the student wants to change advisers, they must discuss the reasons with their track director(s) and submit a request to the academic program administrator. Such changes are considered

upon mutual agreement and availability of an appropriate adviser. Changes will be noted on the students' transcript.

2.3.1.3 Student Grievance Procedure

On occasion, problems may arise between students and other members of the School of Public Health community. The purpose of these guidelines is to help resolve disputes informally between students and other members of the Hopkins community. The student is encouraged to make a good faith effort to resolve the dispute informally prior to initiating formal grievance procedures. For those disputes that cannot be resolved informally, a [Student Grievance Procedure](#) has been created by the School to provide students and student groups with a formal process to seek resolution of a grievance. In certain circumstances, other governing bodies also assist in these situations. A student who has a concern about a decision or act of a faculty or staff member of the Department of Environmental Health and Engineering should follow the steps outlined below.

1. The student should first approach the person or parties (e.g., academic adviser, related office, etc.) directly involved as soon as possible to discuss questions or concerns.
2. If the issue or concern is not resolved informally, the student should contact the program or track director for assistance. A written request for problem resolution is requested at this stage. This request should include specific details about the problem, documentation if appropriate, and a suggestion for resolution.
3. If no resolution can be found in prior steps, the matter will be referred to the Department Chair, who will address the problem as they deem necessary.
4. If the matter is not resolved within the Department or requires review and/or decision at the School or University level, a student should refer to the [School's Student Grievance Procedure document](#).

2.3.1.4 Doctoral Registration

In addition to the School's residency requirement, full-time doctoral students in the Department must register on a continuous basis for a minimum of 16-credits each academic term. Registration is not required during the summer* or interim sessions and tuition funding is typically not provided for these terms. All students are required to discuss course registration with their adviser prior to the start of each term. Students who fail to register by the published deadlines during a regular academic term will incur a late registration fee from the School that must be paid by the student. If a student still does not register after the add/drop deadline for the term, they will be considered withdrawn by the School and the Department. **Some students will be registered by the Department during the summer term for administrative purposes; however, this registration does not imply that didactic courses will be funded.*

2.3.1.5 Time to Completion

Students enrolled in the PhD in Environmental Health have seven years from the time of matriculation to complete their degree requirements. However, it is expected that all doctoral students will have completed the program within five years after matriculation. Students will receive a maximum of five years of funding from the program, dependent on continued satisfactory progress. Student funding beyond five years is not available. A formally approved leave of absence does not count toward this time.

2.3.1.6 Grade and GPA Requirements

Doctoral students must earn a minimum grade on a set of required program-specific core courses: “Pass” for courses offered only on a pass/fail basis; “B” or higher for courses offered for letter grading. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the track directors. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School’s Committee on Academic Standards.

The Bloomberg School of Public Health requires doctoral students to maintain a minimum 3.0 cumulative GPA. Students with a GPA falling below 3.0 will be placed on academic warning and will have one term of registration in which to raise their GPA above the threshold for their degree. The academic program administrator will notify students placed on academic warning and their performance will be reviewed by the track directors. All recommendations about academic standing will then be presented to the Department’s Executive Committee for final disposition. Students not meeting the minimum GPA after one term may be granted additional term(s) on academic warning if academic progress has been shown in the cumulative GPA; any approval beyond one term must be reported to the School’s Committee on Academic Standards.

Students on academic warning must meet with their adviser and track directors each term to review their academic plan and receive approval for their course schedule prior to registering for courses. Students with a cumulative GPA below the minimum may not register for more than 18 credits per term. Any repeated courses count towards this 18-credit limit.

2.3.1.7 Course Waivers

A waiver request will be considered when a student has taken a similar, graduate-level course(s), with a passing grade, in another division of JHU or another university. A waiver will not be granted for courses in which the student received less than a B, or did not receive a letter grade. Please note that the approval of a waiver does not reduce the total number of credits a student is required to earn to meet graduation requirements. Students should [complete the form](#) and attach supporting documentation (i.e. syllabus).

Waivers and substitutions are only approved by the student matters subcommittee, not the adviser. The academic program administrator will notify the student of the outcome and a copy of the form will be kept in the students’ academic file.

2.3.1.8 Teaching Assistant Requirement

Teaching assistant positions provide students with an opportunity to develop their teaching and interpersonal skills, to work professionally with faculty and fellow students, and to contribute service to the Department.

All PhD students are required to serve as TA for one course each year during their second, third and fourth year of the program. Only EHE courses may be used to fulfill this requirement and students must be enrolled in courses on a full-time basis. The academic program administrator maintains a list of EHE courses that are approved to fulfill the TA requirement. Students must receive approval from their adviser prior to accepting a TA position.

Students are required to [complete the online TA training](#) during their first year in the program. The academic program administrator will verify the student has completed the training prior to starting a TA position.

A student will become eligible for compensation once they have satisfied the yearly TA requirement. Compensation is up to \$2,000 per course. Smaller courses requiring less work will pay \$300. Proctors, graders, and other assistants are paid at the rate of \$25 per hour. Students hired at an hourly rate are required to submit weekly time sheets to the departmental payroll coordinator.

An exception to this policy was approved by the Educational Programs Committee in April 2017- PhD students in the second year or later who TA the summer term course, 180.601 Environmental Health, are waived from the compensation restriction.

Through support from the Deans of the Krieger School of Arts and Sciences and the Bloomberg School of Public Health, the Gordis Teaching Fellowship program supports up to 10 fellows per year to teach small, seminar-style courses in the undergraduate program in public health studies. There is the potential for EHE doctoral students to apply for this opportunity after consultation with their adviser.

2.3.1.9 *Journal Clubs and Seminars*

In addition to attendance at formal courses, students are required to attend Departmental and program seminars and track journal clubs. Students are also required to attend the EHE Grand Rounds in which Hopkins faculty, scientists from other institutions, and alumni are invited to present cutting-edge research findings. In addition, students will attend and present (once per year in years 2-4) their ongoing research at the EHE Student Seminar series and attend the annual Departmental research retreat.

2.3.2 *PhD Examinations and Procedures*

The following information regarding doctoral exams serves as a general guide to Departmental policies and procedures. Please note that the School's Policy and Procedure Manual ([School's PPM](#)) for PhD programs provides further details about each exam and related procedures.

2.3.2.1 *Written Comprehensive Examination*

A written comprehensive exam is required of all doctoral students. The examination will be taken upon completion of the EHE-required PhD core courses. The track directors will send written notification of the successful completion of the examination to the academic program administrator. If a student fails the exam they can be terminated from the program. Track directors will decide if a student will be permitted to re- take the exam, and if so, whether they will be examined on a particularly weak area or be required to take another complete exam comprised of new questions. Only one reexamination may be permitted. Failing the reexamination will result in termination from the program. Doctoral students who are not able to continue in the program may request a transfer to one of the Departmental master's programs.

2.3.2.2 *Research Proposal*

All PhD students are required to develop a written proposal to prepare for the preliminary oral examinations. The proposal will be in the form of a standard NIH or other funding agency format. In general, the grant proposal will be drafted as a component of the Writing Scientific Papers and Grant Writing courses. It is the responsibility of the adviser to inform the student if there are any track-specific deviations from this requirement.

2.3.2.3 Departmental Practice Oral Evaluation

In preparation for taking the School-wide preliminary oral examination, all PhD students of the Department of Environmental Health and Engineering are required to achieve satisfactory performance on a Departmental practice oral evaluation. This Departmental evaluation provides an opportunity for the student to demonstrate the effective verbal communication skills and the ability to engage in scientific exchange that will be tested on the official formal School-wide preliminary oral examination.

The evaluating committee will consist of five faculty members with primary or joint appointments in EHE: four from the student's track (including the adviser) and one from within the Department but outside the student's track. The most senior faculty member (excluding the student's adviser) will serve as the chair of the evaluation process. Students should work with their adviser to select the faculty composition and exam time and complete the [Departmental oral evaluation form](#). The academic program administrator will provide the committee members with the student's academic file on the day before the exam. The student must submit a copy of their thesis proposal to the committee members approximately two weeks prior to the exam date. (Note: no more than two of the faculty on this practice evaluation can serve in the group of 5 primary members of the School-wide preliminary oral examination.)

The evaluation commences with a discussion among the faculty (in the student's absence) concerning the student's academic performance and activity. The student is then invited back into the room and begins by presenting a 10-15-minute talk about their thesis proposal. The faculty will question the student to determine whether they are adequately prepared to conduct the research outlined in the proposal. Questions will not be confined to the proposal but can cover any topic deemed to be fundamental to a doctoral student in their particular field. Questioning continues until all faculty members have had the opportunity to ask questions and have acquired sufficient information about the student's knowledge and abilities. The student will then be excused from the room, and the faculty will decide whether the student performed well enough to proceed to the school-wide preliminary oral examination. If the committee feels the student is not ready, they will decide on the appropriate next step. The most common option is to simply allow more time for a student to study and practice answering questions orally, with a repeat of the Departmental practice evaluation at some specified later time. If the student doesn't achieve an acceptable performance level at this second session, the faculty may either decide on a third and final practice session or recommend to the track directors that the student be dismissed from the PhD program. Doctoral students who are not able to continue in the program may request a transfer to one of the Departmental master's programs. Following each of these practice evaluations, the adviser will submit a brief report summarizing the decision of the committee to the track directors and academic program administrator.

2.3.2.4 School-Wide Preliminary Oral Examination

The School-wide preliminary oral examination (POE), administered by the School's Office of Academic Affairs under University guidelines, determines whether the student has the ability, depth, breadth, and knowledge to undertake significant doctoral-level research in their specialized area of interest. The examination should be taken at the earliest possible time, no later than the end of the student's third year in residence, and before significant engagement in dissertation research.

The School provides [guidance for conduct of the preliminary oral exam for PhD students](#). The student and their adviser are responsible for initiating arrangements for this examination. [Requests for](#)

[scheduling the exam](#) must be sent to the School's Office of Records and Registration at least one month prior to the examination; therefore, the form must be submitted in advance of this time to the academic program administrator. All members of the committee must be present at the scheduled exam location. If the student fails the preliminary oral examination and is permitted a re-examination, they must be re-examined within one year.

2.3.2.5 Thesis Advisory Committee

Upon successful completion of the preliminary oral examination, a thesis advisory committee will be formed to provide continuity in the evaluation of progress and development of the student. The principal responsibilities of the committee are to review the student's dissertation proposal, to advise and guide the student's research, and to read and evaluate the student's final dissertation. Students work in consultation with their adviser and/or track directors to select members of the committee.

The committee consists of the student's adviser and two to four other faculty members from both inside and/or outside the student's Department with expertise in areas relating to the proposed research of the student. Membership of the committee may change as dictated by the needs of the student and direction of the research. It is required that the student will meet formally at least twice per year (every six months) with the committee, beginning six months after the successful completion of the school-wide preliminary oral examination and continuously until the final defense. At these meetings, the student will present progress on their thesis project and the committee will offer advice. For each meeting, an evaluation (completed Form C - Thesis Advisory Committee) of the student's development and progress will be prepared by the adviser in consultation with the committee, discussed with the student, and submitted to the academic program administrator to be included in the student's file. As the thesis project progresses, the committee may indicate a target date for completion of the thesis research. Noncompliance with committee meeting requirements is grounds for dismissal from the program.

2.3.2.6 Thesis Research

The thesis must be based on original research, worthy of publication and acceptable to the Department and to the committee of readers. Students should consult the following resources for details on preparing the thesis: [PPM](#), [Library Services](#), [Doctoral Candidate Information](#).

2.3.2.7 Final Oral Defense and Public Seminar

The committee of thesis readers shall conduct the oral defense of the thesis after the thesis advisory committee agrees that the candidate is ready for the formal defense (also known as final oral exam or FOE). During this defense the committee shall evaluate:

- I. The originality and publication potential of the research;
- II. The candidate's understanding of the details of the methodologic and analytic work;
- III. The final quality of the written thesis document.

The final oral examination is a defense of the thesis before a committee of at least four readers. Guidance on committee composition can be found on the [Doctoral Candidate Information page](#). Once a date for the defense has been agreed upon by the committee of thesis readers, a formal request for the final oral defense should be submitted to the Office of Records and Registration at least one month prior

to the exam date. This should be submitted in advance of the one-month period to the academic program administrator for processing. The adviser will confirm that the thesis is in a final form, is ready to be submitted to the readers, and that all other School and Department requirements for the degree have been fulfilled. Thesis readers must have at least one month to read the thesis before the final examination is held as they might have suggested revisions as well. All doctoral candidates are required to give a formal presentation of their completed thesis work at a public seminar.

Doctoral students will have up to 30 days after the final defense to make corrections and submit their electronic thesis. All doctoral students must remain registered during this time. If the funding has not gone over the total number of years allotted, they will receive stipend and health insurance coverage for these 30 days. After the 30 days, they will be terminated from payroll as a graduate student in the Department. Students on the School health plan are responsible for cancelling their insurance and should contact the Student Accounts office jhsph.bursar@jhu.edu.

The Department requires one bound copy of the thesis. The School recommends using [Thesis on Demand](#). The binding should be black and include the students name, degree and year on the spine, with the dissertation title and students name on the front. The Department does not cover the cost of electronic thesis submission or binding. All Departmental copies are placed in an accessible Departmental archive.

2.3.3 2020-21 Core Curriculum: PhD in Environmental Health

The School and the Department have specified a series of required core courses to be completed by all PhD students. PhD students are required to complete at least 64 credits of formal coursework (i.e., not special studies). At least 18 credits of formal coursework are required in courses outside the student's primary department. At least nine of these credits must be taken in the School of Public Health.

YEAR 1

Number	Course	Term	Day/Time
550.860.82	Academic & Research Ethics at JHSPH (0 cr.)	1 st	Online
187.610.01*	Public Health Toxicology (4 cr.)	1 st	W F 3:30-4:50
317.600.01*	Introduction to Risk Sciences and Public Policy (4 cr.)	1 st	M W 5-6:50
	Advanced Environmental Health I (4 cr.)	3 rd	TBA
180.612.01	Advanced Environmental Health II (4 cr.)	4 th	Tu Th 8:30-10:20
340.xxx	Epidemiology	See track requirements	
140.xxx	Biostatistics	See track requirements	

YEAR 2

Number	Course	Term	Day/Time
550.600.60	Living Science Ethics Responsible Conduct of Research (1 cr.)	1 st	W 4:00-5:30
180.661.01	Writing Scientific Papers I (1 cr.)	1 st	W 12-1:20
180.663.01	Grant Writing I (1 cr.)	2 nd	TBA
180.664.01	Grant Writing II (1 cr.)	3 rd	TBA
180.662.01	Writing Scientific Papers II (1 cr.)	4 th	W 12-1:20
EN.570.616	Data Analytics in Environmental Health and Engineering (3 cr.)	Spring (3rd)	TBA

ALL YEARS

Number	Course	Term	Day/Time
180.860.01	EHE Student Seminar & Grand Rounds (1 cr. per term)	1-4	Tu 12-1 and 2 nd Fri each month 12-1
180.840 or 180.820 [†]	Doctoral Special Studies and Research or Doctoral Thesis Research	1-4	
185.xxx	Journal Club (1 cr.)	See track requirements	

*Online section offered. See the [course directory](#) for term information.

†Students initially enroll in 180.840 Doctoral Special Studies and Research. Upon passing the School-wide preliminary oral exam students will enroll in 180.820 Doctoral Thesis Research.

Note: The School's Satisfactory Academic Performance policy requires doctoral students to maintain a minimum GPA of 3.0 and to earn a B or greater in program core courses. Please refer to your track-specific section for additional course requirements.

2.3.4 PhD in Environmental Health Track in Exposure Sciences and Environmental Epidemiology

Track Directors: Chris Heaney, PhD and Kirsten Koehler, PhD

Academic Program Administrator: Katie Phipps, MEd

The Exposure Sciences and Environmental Epidemiology (ESEE) track offers research and training opportunities in key topic areas relevant to environmental and occupational health. These include air, water, the food system, exposures across the life course, metals and synthetic chemicals, environmental microbiology, the built environment, global environmental health, molecular and integrated epidemiology, and the investigation of susceptibility factors and effective interventions. Graduates from the ESEE track work in academic research institutions, health agencies, health departments, public health advocacy organizations, and private industry organizations that are leaders in environmental and occupational health in the United States and around the world.

While the exact course sequence for each student is customized on an individual basis dependent on their background and research interests, coursework generally centers around one of several topic areas as illustrated below. This coursework is designed to achieve in depth and experiential training to complement the core instruction.

Exposure Sciences

Evaluating and preventing or minimizing exposure from airborne, waterborne or foodborne physical, chemical or biological pollutants, and promoting health and safety in occupational and non-occupational environments are major strategies to protect public health. Using principles of chemistry, biology, physics, engineering, epidemiology, risk assessment and mathematics, we develop innovative solutions to environmental contamination problems. We develop techniques to measure contaminants in various media, develop strategies and conduct studies to assess the levels of exposures in populations, evaluate the impact of a hazard, offer solutions on treatment or containment, promote regulations and policies to prevent human or environmental contamination, and perform quality control checks.

Environmental Epidemiology

Understanding the role of the environment in human health is critical to improve health and quality of life in human populations, especially among vulnerable and marginalized groups. Using an epidemiologic approach, we conduct population-based research that incorporates state-of-the art exposure and outcome assessment to evaluate the role of the environment in disease, disability, and other health outcomes and to develop strategies for health promotion and disease prevention and control. We engage with diverse populations nationally and internationally, employ classic and cutting-edge epidemiologic methods, and investigate a broad range of environmental exposures including the natural and built-environment.

Occupational Health

Protecting workers from disease and injury is vital nationally and internationally and is an important component of environmental health. We address work-related health problems and design solutions to control and prevent disease or injury caused by chemical, physical, psychosocial, and biological threats. Our goal is to promote and maintain the health of worker populations, particularly those who are most vulnerable, to ensure healthy and productive working lives. Our research includes occupational

exposure assessment, industrial hygiene, occupational nursing, development and validation of sensors and biomarkers, epidemiology, population health management, health promotion, policy analysis, and intervention studies focused on disease prevention.

Sustainability

It is increasingly apparent that human activities and the evolution of anthropogenic systems into their current forms are moving societies at a rapid pace towards numerous global crises that can threaten public health and ecosystems. In an era of changing climate, there is recognition that our common resources may not be able to be preserved in a manner that will allow us to draw on them at current rates. Research is needed to support interventions aimed at slowing the progression of these ecological crises in order to avoid or minimize their impact on human health and wellbeing. Utilizing systems thinking in combination with core public health disciplines and policy analysis, we build the evidence base for understanding the risks and benefits associated with various models of food production, land, water and energy use, waste management, and other human activities.

2.3.4.1 ESEE Track Seminars and Journal Club

To foster collaboration and enhance research creativity and performance, the ESEE track organizes the following seminars and journal clubs:

- The Johns Hopkins Education and Research Center (ERC) seminar series offered the 1st Monday of each month, a forum for discussion and learning on occupational health research and practice (mandatory for students receiving funding from ERC).
- The ESEE Seminar series, offered on the 3rd Monday of each month, a forum to discuss research ideas and ongoing projects by students and faculty.

The ESEE Journal Club offered jointly with the Department of Epidemiology provides a forum to stay up-to-date with the latest research. Other activities open to students and faculty in the ESEE track include:

- Center for Livable Future's food system-oriented [event program and seminar series](#)
- Environmental Epidemiology Group (bi-monthly meeting)
- Environmental Epigenetic Epidemiology Group (bi-monthly meeting)

2.3.4.2 ESEE Track Faculty

- [Jessie Buckley](#), PhD; Environmental epidemiology, environmental exposures & child health
- [Meghan Davis](#), PhD, DVM; Environmental microbiology, one health, asthma
- [Shima Hamidi](#), PhD; Geospatial data, built environment, housing and transportation & health
- [Christopher Heaney](#), PhD, MS; Environmental epidemiology, water and health, community-based research
- [Kirsten Koehler](#), PhD, MA; Exposure assessment, aerosols, air quality
- [Keeve Nachman](#), PhD, MHS; Risk science, risk assessment, food systems
- [Roni Neff](#), PhD, ScM; Food system, agriculture, sustainability, health disparities

- [Carsten Prasse](#), PhD; Emerging contaminants, engineering processes, analytical detection methods
- [Lesliam Quiros-Alcala](#), PhD; impact of exposure to chemicals, EDCs, PPCPs on disease risks in vulnerable populations
- [Gurumurthy Ramachandran](#), PhD, CIH; Exposure assessment, nanoparticles, risk assessment for nanomaterials
- [Ana Rule](#), PhD; Air pollution, bioaerosols, metal speciation
- [Kellogg Schwab](#), PhD, MSPH; Water, sanitation and hygiene, environmental microbiology, microbial fate and transport
- [Brian Schwartz](#), MD, MS; Environmental epidemiology, sustainability, built environment, lead
- [Genee Smith](#), PhD, MSPH; Environmental epidemiology, health effects of climate change, infectious diseases

2.3.4.3 ESEE Track Core Requirements - 2020-21

All PhD students have the same core requirements. Please refer to the core curriculum for these details. Students receiving funding from the NIOSH Education and Research Center (ERC) may be required to complete additional coursework. Contact your adviser for more information.

† Required for ERC

*Online section offered. See the [course directory](#) for term information.

Required Courses

Number	Course	Term	Credits
340.751-.753	Epidemiologic Methods I-III	1-3	5/term
140.621-.624	Statistical Methods in Public Health I-IV	1-4	4/term
185.801	ESEE Journal Club	1-4	1/term
182.613	Exposure Assessment Techniques for Health Risk Mgmt.	3 rd *	3
182.617.60	Exposure Sciences for Health Risk Assessment	4 th	4
340.680†	Environmental and Occupational Epidemiology	4 th	4
550.601.81	Foundational Principles of Public Health	Cells to Society	0.5
552.603.81	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health	course schedule	0.5

552.609.81	Psychological and Behavioral Factors that Affect a Population's Health		0.5
552.610.81	The Social Determinants of Health		0.5
552.611.81	Globalization and Health: A Framework for Analysis		0.5
552.612.81	Essentials of One Health		0.5

Typical Courses for Exposure Sciences Topic Area

Number	Course	Term	Credits
340.696	Spatial Analysis I: ArcGIS	1 st	3
182.614	Industrial Hygiene Laboratory	2 nd	5
182.625	Principles of Occupational and Environmental Hygiene	2 nd	4
317.610	Risk Policy, Management and Communication	2 nd or 4 th *	3
182.615	Airborne Particles	3 rd *	4
140.698	Spatial Analysis III: Spatial Statistics	3 rd	4
180.625	Community-Driven Epidemiology and Environmental Justice	3 rd	3
317.615	Topics in Risk Assessment	4 th	2
180.647	The Health Effects of Indoor and Outdoor Air Pollution	4 th *	3

Typical Courses for Environmental Epidemiology Topic Area

Number	Course	Term	Credits
188.680	Fundamentals of Occupational Health	1st*	3

340.696	Spatial Analysis I: ArcGIS	1st	3
340.731	Principles of Genetic Epidemiology I	1st	4
260.631	Immunology, Infection and Disease	2 nd	3
340.666	Foundations of Social Epidemiology	2 nd	3
183.631	Fundamentals of Human Physiology	2 nd or 4 th *	4
140.655	Analysis of Longitudinal Data	3 rd	4
140.698	Spatial Analysis III: Spatial Statistics	3 rd	4
180.625	Community-Driven Epidemiology and Environmental Justice	3 rd	3
180.640	Molecular Epidemiology & Biomarkers in Public Health	3 rd or 4 th *	4
140.656	Multilevel Statistical Models in Public Health	4 th	4

Typical Courses for Occupational Health Topic Area

Number	Course	Term	Credits
182.631	Principles of Occupational Safety	1st	2
188.680 ⁺	Fundamentals of Occupational Health	1st*	3
188.694	Health of Vulnerable Worker Populations	1st*	3
182.621	Introduction to Ergonomics	2nd	4
182.625 ⁺	Principles of Occupational and Environmental Hygiene	2nd or 4th*	4
182.623	Occupational Health Management	2nd* or 3rd*	3
188.686	Clinical Environmental and Occupational Toxicology	3rd	3

182.615	Airborne Particles	3rd*	4
188.681†	Onsite Evaluation of Workplace and Occupational Health Programs	4th	5

Typical Courses for Water Topic Area

Number	Course	Term	Credits
260.631	Immunology, Infection and Disease	2 nd	3
180.651	Energy, Environment, and Public Health	3 rd or 4 th *	2
182.626	Issues for Water & Sanitation in Tropical Environmental Health	3 rd	2
182.640	Food- and Water-borne Diseases	3 rd	3

Typical Courses for Food Systems Topic Area

Number	Course	Term	Credits
222.657.01	Food and Nutrition Policy	1 st	2
180.620.81	An Introduction to Food Systems and Public Health	2 nd	4
180.655.01	Baltimore Food Systems: A Case Study of Urban Food Environments	3 rd	4
180.605.01	Food System Sustainability Practicum	4 th	3
180.606.81	Case Studies in Food Production and Public Health	4 th	4
180.644.81	Food System Resilience to Disasters: COVID-19, Climate Change, and Beyond	4 th	2
222.653.01	Food Technology and Health	4 th	3
222.654.01	Food, Culture, and Nutrition	4 th	4

Typical Courses for Built Environment and Communities Topic Area

Number	Course	Term	Credits
340.696	Spatial Analysis I: ArcGIS	1 st	3
180.611	The Global Environment, Climate Change and Public Health	1 st	4
EN 570.605	Interdisciplinary Research Practicum	1 st	3
180.626	Environmental Justice and Public Health Practice	2 nd	3
188.688	Global Sustainability and Health Seminar	2 nd or 4 th	1
140.698	Spatial Analysis III: Spatial Statistics	3 rd	4
180.625	Community-Driven Epidemiology and Environmental Justice	3 rd	3
180.651	Energy, Environment and Public Health	3 rd or 4 th *	2

2.3.5 PhD in Environmental Health: Track in Toxicology, Physiology, and Molecular Mechanisms

Track Directors: Mark Kohr, PhD and Thomas Hartung, MD

Academic Program Administrator: Katie Phipps, MSED

Chronic diseases such as COPD, asthma, cancer, pulmonary fibrosis and cardiovascular diseases are major causes of morbidity and mortality, and environmental exposures are the key drivers of these diseases. Research in the Toxicology, Physiology and Molecular Mechanisms (TPMM) track is focused on discovering novel molecular mechanisms that drive the pathophysiology of major chronic diseases, with the goal of developing prevention and therapeutic strategies to improve public health. The track is supported by NIEHS and NHLBI research training grants.

Students in this track will engage in academic training in specific areas of environmental health with in-depth courses in molecular, toxicologic, physiologic, immunologic, and pathophysiologic sciences. Prior to focusing on a specific area of thesis research, they will also obtain a broad background in environmental health sciences by taking core courses that underlie its scientific basis. During the first year, students will begin to engage in research by doing lab rotations with selected faculty. Training in writing scientific papers and grant proposals is also included in the curriculum.

The research done by PhD students, postdoctoral fellows, and faculty has led directly to an enhanced understanding of the biological changes that represent the early stages and progression of many chronic diseases. The track is aimed towards creating the next generation of scientists with laboratory skills to tackle complex environmental effects in individuals and in the population. Graduates can look forward to successful careers in academic or industrial research and government or regulatory agencies.

2.3.5.1 Research Rotations

Each student must complete at least three research rotations in their first academic year. The purpose of these research rotations is first to expose the students to the spectrum of basic pathophysiologic research questions and laboratory methods, and second to help students select a lab for their own thesis research. Selection of the laboratories for these rotations depends upon the needs and interests of the student – the specific labs are chosen in discussions with the track directors.

The research rotation program is normally structured as follows:

First rotation, Sep 16 to Dec 15

Second rotation, Jan. 11 to March 13

Third rotation, March 23 to May 22

At the end of each rotation, students must present a brief oral summary describing the goals, results, and conclusions drawn from the research experience. By the end of June of the first year, students should select their thesis research adviser.

2.3.5.2 TPMM Journal Club

Students are required to participate in the track journal club, where a current research paper is discussed and analyzed. Students will also form teams and practice critical review of select topics.

2.3.5.3 TPMM Track Faculty

(Note: faculty in **bold** are currently accepting PhD students)

- Shyam Biswal, PhD; Molecular mechanisms, pathophysiology and therapeutics of COPD and lung cancer
- **Joseph P. Bressler, PhD**; Neurotoxicology
- Srinivasan Chandrasegaran, PhD; Genome editing of human pluripotent stem cells; Total synthesis of designer chromosomes
- Robert Fitzgerald, PhD; Control of the cardiopulmonary system
- Alan M. Goldberg, PhD; Farm animal welfare as it relates to human health
- **John D. Groopman, PhD**; Molecular biomarkers of environmental carcinogens and chemoprevention
- **Thomas Hartung, MD, PhD**; Developmental neurotoxicity, immunotoxicity & endocrine disruption with integrated omics-technologies
- **Mark Kohr, PhD**; Sex-dependent differences in cardiovascular physiology and disease; redox signaling mechanisms
- **Wayne Mitzner, PhD**; Pathophysiologic mechanisms underlying asthma and COPD
- **Fenna Sillé, PhD, MS**; Developmental immunotoxicity in the context of chronic/infectious diseases & vaccine efficacy
- **Zhibin Wang, PhD**; Epigenomic mechanisms in the pathogenesis of environmental diseases
- Marsha Wills-Karp, PhD; Genetic and environmental mechanisms of asthma and allergy

JOINT FACULTY

- Robert Brown, MD; Asthma and COPD in humans, Lung imaging
- Robert A Casero, PhD; Role of polyamine catabolism in inflammation-associated carcinogenesis
- Valeria Culotta; PhD; Pathogens and metal toxicity
- Rachel Damico, MD; Role of the pulmonary endothelium in lung disease
- **Maureen Horton, MD**; Role of immune system and extracellular matrix in lung fibrosis
- Sharon McGrath-Morrow, MD; Pediatric lung diseases
- **Alan Scott, PhD**; Immunology of lung disease
- **James Sham, PhD**; Cardiac and pulmonary vascular cell physiology
- **Ramana Sidhaye, MD**; Quantitative changes in lung epithelial structure and function in response to environmental insults
- Robert Wise, MD; Pathogenesis of COPD

2.3.5.4 TPMM Track Required Courses 2020-21

All EHE PhD students share a set of core course requirements. Additionally, TPMM students must complete the following track-specific requirements. Please visit the [JHSPH Course Directory](#) and/or [SIS](#) for course information.

Number	Course Name	Term
185.805	TPMM Journal Club (1 cr.)	1 & 2
185.806	Advanced Concepts TPMM (2 cr.)	3 & 4
187.640	Toxicology 21: Scientific Foundations (1 cr.)	2
183.631	Fundamentals of Human Physiology (4 cr.)	2
187.632	Molecular Toxicology (4 cr.)	2
260.709	Molecular Biology and Genomics (SOM) (3 cr.)	2
360.728	Pathways and Regulation (SOM) (3 cr.)	3
110.728	Cell Structure and Dynamics (SOM) (3 cr.)	3
140.615	Statistics for Laboratory Scientists I (4 cr.)	3
140.616	Statistics for Laboratory Scientists II (4 cr.)	4
187.633	Intro to Environmental Genomics and Epigenomics (3 cr.)	4
187.634	Analysis for Environmental Genomics and Epigenomics (1 cr.)	4
340.618	Epidemiology: The Basics (3 cr.)	4
260.611	Principles of Immunology I (4 cr.)	1 (2 nd yr)
260.612	Principles of Immunology II (4 cr.)	2 (2 nd yr)

Cells to Society courses:

TPMM PhD students must complete the following <u>Cells to Society courses</u> prior to scheduling their school-wide preliminary oral exam.	
552.601	Foundational Principles of Public Health (0.5 cr.)
552.605	The Science of Primary, Secondary, and Tertiary Prevention in Population Health (0.5 cr.)
552.609	Psychological and Behavioral Factors that Affect a Population's Health (0.5 cr.)
552.610	The Social Determinants of Health (0.5 cr.)
552.611	Globalization and Population Health (0.5 cr.)

Note: TPMM track PhD students must earn a minimum grade on these track-specific required courses: "Pass" for courses offered only on a pass/fail basis; "B" or higher for courses offered for letter grading. A student who receives one 'C' in a track-specific course must notify their track directors and their research

adviser as soon as the grades are released to determine whether repeating the same course or completing other courses/assignments that is relevant to that track-specific core course. The department's Educational Programs Committee must be notified when a student receives more than one 'C' from the track-specific courses.

Course Schedule for Year 1

1st Term

Number	Course Title	Format	Time	Credits
180.840	Doctoral Special Studies & Research	Remote	N/A	2
180.860	EHE Student Seminar & Grand Rounds	Zoom (Live)	Tu 12-1 & 2 nd F 12-1	1
185.805	TPMM Journal Club	Zoom (Live)	M 3:30-5	1
187.610	Public Health Toxicology	Hybrid (Panapto/Zoom)	WF 3:30-4:50	4
317.600	Intro. to Risk Sciences & Public Policy	Hybrid (Panapto/Zoom)	MW 5-6:50	4
550.860	Academic & Research Ethics at JHSPH	Online	N/A	0

2nd Term

Number	Course Title	Format	Time	Credits
180.840	Doctoral Special Studies & Research	Remote	N/A	2
180.860	EHE Student Seminar & Grand Rounds	Zoom (Live)	Tu & 2 nd F 12-1	1
183.631	Fundamentals of Human Physiology	Online (w/LiveTalks)	N/A	4
185.805	TPMM Journal Club	Zoom (Live)	M 3:30-5	1
187.632	Molecular Toxicology	Online (w/LiveTalks)	N/A	4
187.640	Toxicology 21: Scientific Foundations	Hybrid (Panapto/Zoom)	W 3:30-4:20	1
260.709	Molecular Biology and Genomics (SOM)	Hybrid (Zoom/Blackboard)	MWF 9-10:30 (11/5-12/11)	3

3rd Term

Number	Course Title	Format	Time	Credits
110.728	Cell Structure and Dynamics (SOM)			3
140.615	Statistics for Laboratory Scientists I		MWF 10:30-11:20	4
180.840	Doctoral Special Studies & Research			3

180.860	EHE Student Seminar & Grand Rounds	Zoom (Live)	Tu 12-1 & 2 nd F 12-1	1
185.806	Advanced Concepts in TPMM		M 3:30-5:30	2
	Advanced Environmental Health I			4
360.728	Pathways and Regulation (SOM)		TTh 9:00-10:30 (1/2-2/27)	3

4th Term

Number	Course Title	Format	Time	Credits
140.616	Statistics for Laboratory Scientists II		MWF 10:30-11:20	4
180.612	Advanced Environmental Health		TTh 8:30-10:20	4
187.633	Intro to Environmental Genomics & Epigenomics		WF 3:30-5:00	3
187.634	Analysis for Environmental Genomics and Epigenomics		F 5:00-6:00	1
185.806	Advanced Concepts in TPMM		M 3:30-5:30	2
340.618	Epidemiology: The Basics		Online	3
180.840	Doctoral Special Studies & Research			1
180.860	EHE Student Seminar & Grand Rounds		Tu & 2 nd F 12-1	1

Year 2

1st Term

Number	Course Title	Time	Credits
180.661	Writing Scientific Papers I	W 12:00-1:20	1
180.840	Doctoral Special Studies & Research		9
180.860	EHE Student Seminar & Grand Rounds	Tu & 2 nd F 12-1	1
185.805	TPMM Journal Club	M 3:30-5:00	1
260.611	Principles of Immunology I	Tu Th 8:30-10:20	4
550.600	Living Science Ethics- Responsible Conduct of Research	W 4:00 - 5:30 PM	1

2nd Term

Number	Course Title	Time	Credits
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180.663	Grant Writing I	M 9:00-9:50	1
180.840	Doctoral Special Studies & Research		9
180.860	EHE Student Seminar & Grand Rounds	Tu & 2 nd F 12-1	1
185.805	TPMM Journal Club	M 3:30-5:00	1
260.612	Principles of Immunology II	TTh 8:30-10:20	4

3rd Term

Number	Course Title	Time	Credits
Select 8 or more credits from the list of electives			8
180.664	Grant Writing II	TBA	1
180.840	Doctoral Special Studies & Research		4
180.860	EHE Student Seminar & Grand Rounds	Tu & 2 nd F 12-1	1
185.806	Advanced Concepts in TPMM	M 3:30-5:30	2
	Data Analytics for Environmental Health and Engineering	Spring semester (terms 3 & 4)	

4th Term

Number	Course Title	Time	Credits
Select 8 or more credits from the list of electives			8
180.662	Writing Scientific Papers II	W 12-1:20	1
180.840	Doctoral Special Studies & Research		5
180.860	EHE Student Seminar & Grand Rounds	Tu & 2 nd F 12-1	1
185.806	Advanced Concepts in TPMM	M 3:30-5:30	2
	Data Analytics for Environmental Health and Engineering	Spring semester (terms 3 & 4)	

Suggested Electives

Number	Course Name	Time	Term	Credits
180.640	Molecular Epi and Biomarkers in Public Health	T, Th 3-4:20	3	4
183.638	Mechanisms of Cardiopulmonary Control	F 3:30-5:20	3	2
183.642	The Cardiopulmonary System Under Stress	F 3:30-5:20	4	2

183.643	Essentials of Pulmonary Function Measurements	TBA	4	3
187.645	Toxicology 21: Scientific Applications	Online	3	3
187.650	Alternative Methods in Animal Testing	Online	3	3
187.655	Evidence-Based Toxicology	Online	4	3
187.661	Environmental Health in Neurological and Mental Disorders	Online	4	3

2.4 PHD IN GEOGRAPHY AND ENVIRONMENTAL ENGINEERING

Academic Program Administrator: Jessica Elroy

A PhD student in the Geography and Environmental Engineering program will explore the current state of knowledge in his or her field. Information and ideas developed by others are critically examined and placed in proper context. Subject areas are identified that are important to achieving the goals of the discipline, but which have not been explored or developed. The student will propose new research to improve understanding in this key area.

The goals for students in this Ph.D. program are:

- to develop reasoning skills that can be applied to new and unanticipated issues;
- learn how to pose questions and answer them in a logical manner;
- acquire a depth of understanding and technical knowledge in a particular study area, on par with others worldwide; and
- make a significant contribution to our understanding in this particular study area.

The emphasis in the Ph.D. degree is upon a sound foundation in the fundamentals required in a given area with considerable flexibility in course selection determined by the interests and background of each graduate student. Doctoral students must complete their formal coursework within their first two years of the program. The coursework should cover both the student's principal research area and include some breadth.

Students may request to move to non-resident status in their final semester, with the approval of the department and Dean's Office once they have completed all exams and a defense date has been scheduled.

All students must pass departmental (DQE) and Graduate Board oral (GBO) examinations for the doctorate. Usually these examinations are taken after two years of academic work. Research leading to the dissertation should make an original contribution to the chosen field of specialization, and the result must be worthy of publication. A final dissertation defense that involves an open seminar and a closed oral examination is required of all EHE doctoral students.

2.4.1 Policies

2.4.1.1 Faculty Advisers

PhD students are recruited by and assigned a faculty adviser once they are admitted to the program. The adviser serves as the primary contact for the Department and will assist the student with course selection each semester, planning research rotations if appropriate, preparation of seminar presentations, and the interpretation of Departmental and School policies. This affiliation, however, does not exclude significant interactions with other members of the faculty. The faculty adviser and academic program administrator must approve student registration and course plans (as applicable). Each academic year, the adviser and the student must review academic progress and determine plans

for the future year that will keep the student on track toward graduation. This information is also reviewed by the director of graduate studies and the academic program administrator. In the event that the student wants to change advisers, they must discuss the reasons with the director of graduate studies and submit a request to the academic program administrator. Such changes are considered upon mutual agreement and availability of an appropriate adviser. Changes will be noted on the students' transcript.

2.4.1.2 Doctoral Registration

In addition to the School's residency requirement, full-time doctoral students in the Department must register on a continuous basis for a minimum of 20-credits each semester. Registration is not required during the summer (see note) or interim sessions and tuition funding is typically not provided for these terms. All students are required to discuss course registration with their adviser prior to the start of each semester. Full-time students who fail to register by the published deadlines during a regular academic semester will incur a late registration fee from the School that must be paid by the student. If a student still does not register after the add/drop deadline for the term, they will be considered withdrawn by the School and the Department.

Note: Some students will be registered by the Department during the summer term for administrative purposes; however, this registration does not imply that didactic courses will be funded.

2.4.1.3 Grade and GPA Requirement

The Department requires doctoral students to maintain a minimum 3.0 cumulative GPA. Students with a GPA falling below 3.0 will be placed on academic warning and will have one semester of registration in which to raise their GPA above the threshold for their degree. The academic program administrator will notify students placed on academic warning and their performance will be reviewed by their adviser, Director of Graduate Studies, and Department Chair. All recommendations about academic standing will then be presented to the Office of Graduate Affairs. Students not meeting the minimum GPA after one semester may be granted additional semester(s) on academic warning if academic progress has been shown in the cumulative GPA. Students on academic warning must meet with their academic adviser and program director each semester to review their academic plan and receive approval for their course schedule prior to registering for courses.

In addition to attendance at formal courses, students are required to attend department seminars. These seminars include:

- **M. Gordon Wolman Seminar (EN.570.841)** for which Hopkins faculty, scientists from other institutions, and alumni are invited to present their latest research results
- **EHE Student Seminar and Grand Rounds (PH.180.860)** where students will attend and present (once per year in years 2-5) their ongoing research

Additionally, beginning in the third year of their program, students are required to participate in the annual Departmental research retreat. First and second year students are required to attend and encouraged to participate.

2.4.1.4 PhD Examinations and Procedures

2.4.1.4.1 Departmental Qualifying Examination (DQE)

The evaluating committee will consist of five faculty members with primary or joint appointments in EHE: four from WSE (including the adviser) and one from within the Department but from BSPH. The most senior faculty member (excluding the student's adviser) will serve as the chair of the evaluation process. Students should work with their adviser to select the faculty composition and exam time and complete the Departmental oral evaluation form provided by the office of the academic program administrator.

A brief research proposal should be submitted but the purpose for this exam is to ensure that the student has the depth and breadth of knowledge from their coursework to proceed in their degree candidacy.

The evaluation commences with a discussion among the faculty (in the student's absence) concerning the student's academic performance and activity. The student is then invited back into the room and begins by presenting a 10-15-minute talk about their thesis proposal. The faculty will question the student to determine whether they are adequately prepared to conduct the research outlined in the proposal. Questions can cover any topic deemed to be fundamental to a doctoral student in their particular field. Questioning continues until all faculty members have had the opportunity to ask questions and have acquired sufficient information about the student's knowledge and abilities. The student will then be excused from the room, and the faculty will decide whether the student performed well enough to proceed to the Grad Board preliminary oral examination. If the committee feels the student is not ready, they will decide on the appropriate next step. The most common option is to simply allow more time for a student to study and practice answering questions orally, with a repeat of the Departmental qualifying evaluation at some specified later time. If the student doesn't achieve an acceptable performance level at this second session, the faculty may either decide on a third and final practice session or recommend to the track directors that the student leave the PhD program. Doctoral students who are not able to continue in the program may request a transfer to one of the Departmental master's programs. Following each of these practice evaluations, the adviser will submit a brief report summarizing the decision of the committee to the academic program administrator.

2.4.1.4.2 Graduate Board Preliminary Oral Examination (GBO)

The Graduate Board preliminary oral examination (GBO), administered by the School's Office of Academic Affairs under University guidelines, determines whether the student has the ability, depth, breadth, and knowledge to undertake significant doctoral-level research in their specialized area of interest. The examination should be taken at the earliest feasible time, no later than the end of the student's third year in residence, and before significant engagement in dissertation research.

The student and their adviser are responsible for initiating arrangements for this examination. Requests for scheduling the exam and committee approval must be sent to the Graduate Board at least two weeks prior to the examination; therefore, the form must be submitted in advance of this time to the academic program administrator. All members of the committee must be present at the scheduled exam location; teleconference participation is not permitted. If the student fails the

preliminary oral examination and is permitted a re-examination, they must be re-examined within one year.

2.4.1.4.3 Final Oral Defense and Public Seminar

The committee of thesis readers shall conduct the oral defense of the thesis after the thesis advisory committee agrees that the candidate is ready for the formal defense (also known as Final Oral Exam or FOE). During this defense the committee shall evaluate:

1. The originality and publication potential of the research;
2. The candidate's understanding of the details of the methodologic and analytic work;
3. The final quality of the written thesis document.

The adviser will confirm that the thesis is in a final form that is ready to be submitted to the readers and that all other School and Department requirements for the degree have been fulfilled. Once the adviser has confirmed this status, then a date should be agreed upon by the defense committee and the student should notify the Academic Program Administrator for records purposes and the Administrative Coordinator for scheduling purposes.

The final oral examination is a defense of the thesis before a committee of at least four readers. Typically, most or all of the members of this committee were also members of the student's thesis advisory committee. The readers include the thesis adviser and at least three other faculty members with the rank of assistant professor or higher. At least three Departments of the University, including at least two Departments within WSE must be represented. Normally, two readers are from EHE. The senior faculty member outside EHE will normally serve as chair and must hold the rank of full or associate professor.

The primary appointment of faculty members determines whether they are considered inside or outside the Department.

The thesis should be in its final form before distribution to the readers. This is confirmed by the adviser signing off on the thesis before it is distributed to the readers. Thesis readers must have at least one month to read the thesis before the final examination is held as they might have suggested revisions as well.

All doctoral candidates are required to give a formal presentation of their completed thesis work at a public seminar. Administrative staff is available to assist in scheduling a room for this event as well as advertising this event to the appropriate audience.

The Department requests one bound copy of the thesis. The School recommends using Thesis on Demand. The binding should be black, the student's name, degree and year should be on the spine, and thesis title and name on the front. The Department does not cover the cost of electronic thesis submission or binding. All Departmental copies are placed in Ames 316.

2.4.1.5 Time to Completion

PhD students have twelve years from the time of matriculation to complete their degree requirements. However, it is expected that all doctoral students will have completed the program within five years after matriculation. A formally approved leave of absence does not count toward this time.

Though time-to-degree is determined by the department and may not exceed 12 years, continuation in the program will be based/contingent upon satisfactory academic progress after eight years of enrollment.

2.4.2 Recommended Curriculum

In addition to the two required courses for all EHE PhD students, EN.570.616 Data Analytics in Environmental Health and Engineering and PH.180.612 Advanced Environmental Health, and the departmental seminars (EN.570.841 and PH.180.860) students are expected to take three courses, drawn from at least two of the focus areas listed below.

Focus Area: Environmental Science and Engineering

EN.570.610 Engineering Microbiology

EN.570.441 Environmental Inorganic Chemistry

EN.570.642 Environmental Organic Chemistry

EN.570.643 Aquatic and Biofluid Chemistry

EN.570.652 Experimental Methods in Environmental Engineering Chemistry

EN.570.657 Air Pollution

EN.570.644 Physical and Chemical Processes

EN.570.446 Biological Process of Wastewater Treatment

EN.570.615 Current Trends in Environmental Microbiology

EN.570.619 Methods in Microbial Community Analysis

EN.570.690 Solid Waste Engineering and Management

EN.570.691 Hazardous Waste Engineering and Management

Focus Area: Environmental Systems Analysis, Management and Economics

EN.570.693 Economic Foundations for Environmental Engineering and Policy Design

EN.570.695 Environmental Health and Engineering Systems Design

EN.570.697 Risk and Decision Analysis

EN.570.607 Energy Policy and Planning Models

AS.270.615 Inversion Modeling & Data Assimilation

SA.680.760 Climate Change: Science, Economics and Politics

SA.680.855 Life Cycle Assessment

Focus Area: Land Air and Water Resources

EN.570.653 Hydrology

EN.570.633 Hydrologic Processes and Modeling

EN.570.654 Geostatistics: Understanding Spatial Data

EN.570.651 Environmental Transport and Dispersion

EN.570.6xx Groundwater, Hydrogeology and Porous Media

EN.570.6xx Water quality modeling of rivers, lakes, and wetlands

AS.270.618 Remote Sensing of the Environment

AS.270.653 Earth and Planetary Fluids II

AS.270.641 Present and Future Climate

EN.570.657 Air Pollution

Focus Area: Public Health/Environmental Health

Courses from Bloomberg School of Public Health listed under the PhD in Environmental Health section of this handbook.

We anticipate that most students would need to take more than 5 courses as suggested above to be prepared for their thesis research. However, we have limited the requirements to 5 courses, to be less restrictive, and to give students the flexibility to take additional courses relevant to their research, in consultation with their advisor.

PhD students who have already taken some of the above courses during their MSE or have taken equivalent graduate-level courses as part of their master's programs at other institutions may apply for waiver of some of these course requirements. We strongly encourage these students to take at least 3 additional courses as part of their PhD course requirements. The courses may be selected in consultation with the student's primary advisor and submitted for approval to the Director of Graduate Studies.

3 MA IN GEOGRAPHY AND ENVIRONMENTAL ENGINEERING

The MA in Geography and Environmental Engineering is a degree program open to students with undergraduate degrees in social sciences or the humanities. Three semesters of coursework are typically required to complete the degree and MA students have the option to complete an independent research project, submitted as a formal essay. Students can focus on one of the Department's areas of interest or construct their own program that complements and expands their undergraduate experience. Each individual's program of study is planned by the student in consultation with department faculty and must be approved by the faculty adviser.

3.1 DEGREE PROGRAM REQUIREMENTS

- A minimum of 30 credits including no more than 1 credit of seminar, 1 credit of intersession course work, 1.5 credits from the Center for Leadership Education (with adviser approval) and 6 credits of independent research counting toward the 30 credits
- At least 50 percent of the 30 credits must come from courses within the department
- Students are permitted to apply up to two classes with a grade of "C" toward their degree. No classes with "D" or "F" can be applied
- Five to six required courses and four to five recommended elective courses depending on track (note: in order to substitute an alternate course for a recommended elective, students must receive written approval from their adviser)
- Prerequisites (required) for the MSE program includes mathematics through differential equations and computing skills.
- AAP ([Advanced Academic Programs](#)) or EP ([Engineering for Professionals](#)) courses can be taken and counted to receive a master's degree as long as there is sufficient rigor as deemed by the adviser. Students must have written consent from their adviser (an email will suffice) prior to signing up for the course.
- The Whiting School of Engineering strongly discourages master's students from using 300-level courses to count towards the required number of master's graduation credits. Exceptions to this rule should be reviewed on a case-by-case basis by the department. No more than two 300-level courses can be used to count towards the 30 master's-level credits required for graduation. Advisers must provide an email to the academic program administrator to be kept in the student's file. The email must indicate:
 - The 300-level course has been reviewed and deemed to have acceptable rigor, and
 - Where applicable, identifying the name and course number of the class that the 300-level course will replace.

4 MHS IN ENVIRONMENTAL HEALTH

Program Director: Megan Latshaw, PhD, MHS

Academic Program Administrator: Katie Phipps, MEd

Students may choose an area of interest from the following options, or they may develop their own path in consultation with their adviser.

Food Systems, Water, and Environmental Sustainability

The Food systems, Water, and Environmental Sustainability area of interest provides a deeper understanding of changes in the global environment and how their consequences affect human health at the individual and population levels. Graduates understand the environmental health implications of a rapidly increasing global population, at a time of diminishing food and fuel resources, and a changing climate. Coursework and seminars expose students to a range of sustainability topics: food production, security and systems; energy source impacts on public health; water supply and reuse; policy and health impacts of climate change, urban sprawl, and the green movement. Students critically analyze the complex interactions of global environmental problems, such as climate change, loss of biodiversity, ecosystem degradation and the depletion of other global resources, all in the context of their impact on health. These students often pursue the [Food System, Environment and Public Health Certificate](#). Ideal for students with a strong background in environmental science and sustainability.

Health Security

The Health Security area of interest provides an understanding of domestic and international health threats, including epidemics, natural disasters, technological accidents, and intentional attacks. Students examine major organizations and initiatives designed to prevent, detect, and respond to health security threats; assess the current status of health security preparedness; and evaluate strategies to enhance health security. The area of interest is designed for individuals who would like careers in public health and healthcare preparedness, global health security, outbreak and epidemic management, disaster response, and related fields. A subset of courses are taught by faculty from the Johns Hopkins Center for Health Security and informed by the Center's two decades of scholarship and advocacy on health security policy.

Population Environmental Health

The Population Environmental Health area of interest presents a population view of environmental health with courses in epidemiology, statistics and environmental health principles. Through coursework and optional direct participation, students develop an understanding of the problems that affect subsets of the population, as well as challenges faced in their solution. Students master the use of statistical approaches to public health and develop skills in epidemiologic research. Individuals interested in applying environmental health sciences in a community or clinical setting benefit from this focus. The [Risk Sciences and Public Policy Certificate](#) is often completed concurrently. Ideal for students with a good basic science and quantitative foundation.

Pre-Medicine

The Pre-medicine area of interest provides a foundation for students planning to attend medical school. Core courses lead to basic mastery of statistics as well as an understanding

of epidemiology. Elective courses in physiology, advanced toxicology, and environmental and occupational disease not only emphasize knowledge covered on the MCAT but they also differentiate graduates from the typical medical school applicant. Ideal candidates possess a strong foundation in the basic sciences and math.

Toxicology for Human Risk Assessment

Toxicology for human risk assessment emphasizes laboratory and basic science approaches to the study of environmental agents that affect health. Building upon the required introductory course in toxicology, additional courses cover advanced toxicology, environment-related disease, and laboratory-based statistics. Through lectures, discussion and class assignments, students develop a solid understanding of the ways in which environmental exposures can translate into health risks, as well as ways in which these risks can be evaluated and mitigated. Many students also complete requirements for the [Risk Sciences and Public Policy Certificate](#). Ideal candidates possess a strong background in the basic sciences, including biology and chemistry.

4.1 REQUIREMENTS

4.1.1 Coursework

Students consult the course list in this handbook and get formal approval from their faculty adviser prior to registration. Required core courses include environmental health, toxicology, epidemiology, risk sciences, and statistics. Electives allow students to select courses according to their interests and career goals. In order to substitute a recommended course with something not listed, approval must be granted by the program director. Students may also consider earning [certificates](#) in addition to the MHS.

MHS students formally meet as a group four times during the academic year. These meetings aim to build community, provide professional development, and share information about administrative, course or other programmatic issues. Attendance is mandatory for MHS students, as is attendance at the EHE Grand Rounds seminars scheduled on the second Friday of each month, and at the master's presentations in May. This attendance, along with monthly check-ins with advisers, and meeting deadlines for the essay, forms the basis of the grade for special studies courses in terms 2-4 (181.845 MHS Special Studies & Research in term 2 and 181.850 MHS Essay in terms 3 and 4). Students who do not successfully complete the requirements for all three terms of this special studies course face dismissal from the program. Failure to complete the program within four years from the date of matriculation also serves as grounds for dismissal. [Conferral deadlines can be found here](#).

4.1.2 Essay

MHS students write an essay and present a summary of it during a formal symposium. The essay serves as an integrating experience for students, representing a substantive application of analytic and technical skills learned during the degree program. The content addresses a current environmental health problem pertinent to the educational goals of the student and approved by the adviser. The essay typically is not a research paper or thesis, but rather an informative and in-depth literature review that includes potential solutions to the problem. Ideally students work with community-based organizations, governmental agencies or researchers on a real-world issue. A more detailed guidance document for the essay will be shared with students during their second term.

The essay must be between 6,000 and 8,000 words of text (equivalent to about 20 pages), with at least 30 peer-reviewed journal article references in addition to other references (e.g. government sources). The pages must be 1.5 or double-spaced using 12-point font with one-inch margins. All essays must contain a title page; table of contents; text with section headings and a reference list. The reference citations in the text and the reference list should follow the format used by [Environmental Health Perspectives](#), the journal of the National Institute of Environmental Health Sciences (NIEHS). Tables and figures may be incorporated into the body of the text but must be annotated to indicate the source of each.

The student will meet with the adviser throughout the essay-writing process in order to ensure fulfillment of essay requirements, as well as assure that the essay is properly prepared for presentation and final approval. The essay must be reviewed and approved by the adviser and one other faculty member or expert chosen by the student and approved by the adviser. The MHS essay must be prepared in a timely manner, so that the adviser and second reader have adequate time to provide comments to be incorporated into the final document.

2020-21 Timeline

Below is the list of milestones and deadlines that must be met. Note that meeting these expectations is linked to receiving a grade of “pass” in 181.845 and 181.850. It is ultimately the student’s responsibility to meet the benchmarks and deadlines listed below. Any student who fails to meet the April or May deadlines will be automatically removed from the May graduation list.

Date	Deliverable
Oct 14	Quarterly MHS Meeting at noon
Nov 4	Essay topic approved by adviser & sent to Program Director
Nov 18	Quarterly MHS Meeting at noon
Nov 25	Draft outline and literature review sent to adviser (cc to Program Director) for suggestions
Dec 9	Outline and literature review approved by adviser (email forwarded to Program Director)
Jan 20	First draft of essay submitted to adviser for suggested modifications (cc Program Director)
Feb 10	Quarterly MHS Meeting at noon
Feb 17	Second draft of essay submitted to adviser for suggestions (cc Program Director)
Mar 24	Final version of essay to adviser (cc Program Director)
Mar 31	Essay approved by adviser and sent to second reader (email forwarded to Program Director)

Apr 14	Corrections to essay, based on reader's comments, are submitted to adviser or reader for review
Apr 14	Quarterly MHS Meeting at noon
Apr 23	Adviser and second reader approve essay (email forwarded to Program Director)
May 4-7	MHS/ScM Presentations in the morning

4.1.3 Presentation

All students completing the MHS are required to make at least one presentation of their essay to an audience of faculty and students of the Department. This presentation will be based on the student's essay and will typically occur after completion of the written essay. Each student is allotted 15 minutes: 10 minutes for the presentation and 5 minutes for questions and answers.

4.2 POLICIES

In addition to program- and department-level policies, students are responsible for following [School-](#) and [University-level policies](#).

4.2.1 Credit Transfer

Students who have taken courses at the school within the past three years must have earned a grade of B or higher in courses to fulfill a program requirement; grades of C may only be transferred towards elective credits. **BA/MHS students** in the public health studies major must fulfill the requirement for 15 credits of coursework taken at JHSPH while a senior. Online courses do not count towards this requirement. Up to one-half, but no more than 16 of the JHSPH credits taken as a public health studies undergraduate student may be applied to the MHS program.

4.2.2 MHS to ScM Transfer Process

The Department asks MHS students interested in transferring to the ScM to formally apply at the start of term 2. Identification of an appropriate and willing faculty research mentor serves as an essential step in the process, which should be initiated as early as possible, preferably while an applicant to the MHS program.

By the middle of term 2, MHS students submit an ScM transfer request form. The form includes a brief explanation of how the ScM research opportunity fits with the student's educational and research goals. It must be signed by the current MHS adviser. In addition, the proposed research faculty needs to provide a letter of willingness to assume the role and responsibilities of ScM thesis adviser (this person may or may not be the current MHS adviser). A transcript of the first and second term courses and grades (obtained by the academic program administrator) completes the file for review. Students must demonstrate excellent academic success at the graduate level in the first two terms of the year (minimum GPA of 3.0).

A sub-group of the ScM research faculty (program director and 2-3 others) will review the file to confirm that the requirements have been met and, based on that input, the program director will approve or disapprove of the request for degree transfer. The academic program administrator will inform the

Office of Records and Registration of the degree transfer and adviser change (if appropriate) to be effective term 3. During third term, MHS-to-ScM students shift from drafting an essay to drafting a proposal.

4.2.3 Advisers

All master's students will be assigned an adviser, who serves as the primary contact for the Department, assists the student with course selection each term, approves their essay or thesis, and helps interpret Departmental and School policies. The student is free to change advisers, but this change must be approved by the program director and sent to the academic program administrator via email.

4.2.4 Assessment of Progress

Students must meet minimum academic standards to remain in the master's program. Each term the student should review grades from the previous term with their adviser. Specific goals will be determined following this review. A student who is experiencing academic difficulty will be notified in writing if they are expected to achieve a specific GPA during the upcoming term. Failure to meet any of the following criteria is grounds for dismissal from the program.

Cumulative GPA

The School requires master's students to maintain a minimum 2.75 cumulative grade point average. Students with a GPA falling below 2.75 will be placed on academic warning and will have one term of registration in which to raise their GPA above the threshold for their degree. The academic program administrator will notify students placed on academic warning and their performance will be reviewed by the Educational Programs Committee (EPC). All recommendations about academic standing will be then presented to the Department's Executive Committee for final disposition. Students not meeting the minimum GPA after one term may be granted additional term(s) on academic warning if academic progress has been shown in the cumulative GPA; that approval beyond one term must be reported to the School's Committee on Academic Standards. Students on academic warning must meet with their academic adviser and program director (or academic program administrator) each term to review their academic plan and receive approval for their course schedule prior to registering for courses. Students with a cumulative GPA below the minimum may not register for more than 18 credits per term. Any repeated courses count towards this 18-credit limit.

Grades in Core Courses

Students must earn a minimum grade on a set of required program-specific core courses: "Pass" for courses offered only on a pass/fail basis: "C" or higher for master's students for courses offered for letter grading. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the program director. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School's Committee on Academic Standards.

4.2.5 Registration

It is the student's responsibility to register for courses during the appropriate time periods specified by the [Office of Records and Registration](#) (and available [on the academic calendar](#)). Students are expected to discuss course plans with their adviser before registration and confirm registration details with their

adviser every term. Regardless of funding sources such as grants, stipends, etc., students are responsible for any applicable fees if they do not register properly.

4.2.6 Course Waivers

A waiver request will be considered when a student has taken a similar, graduate-level course(s), with a passing grade, in another division of JHU or another university. A waiver will not be granted for courses in which the student received less than a B, or did not receive a letter grade. Please note that the approval of a waiver does not reduce the total number of credits a student is required to earn to meet graduation requirements. Students should [complete the form](#) and attach supporting documentation (i.e. syllabus).

Waivers and substitutions are only approved by the student matters subcommittee, not the adviser. The academic program administrator will notify the student of the outcome and a copy of the form will be kept in the students' academic file.

4.3 MHS CURRICULUM

4.3.1 Full-time

Each term, students should register for at least 16 credits in order to reach the 64-total credit requirement. Students reach this 16-credit per-term minimum by first registering for the required courses, then choosing among the elective courses. Some sections may be available online. Please refer to the [course directory](#) for the most current information. If you would like to substitute a recommended course with something not listed, contact the program director. Students may create their own program or they may choose an area of interest:

- **FSWES** – Food Systems, Water & Environmental Sustainability
- **HS** – Health Security
- **PEH** – Population Environmental Health
- **PM** – Medical School Preparation
- **TPRA** – Human Toxicology, Pathophysiology, and Risk Assessment

First Term

Number	Course	Day/Time	Credits
180.609	Principles of Environmental Health I	MW 1:30-3:20	4
187.610	Public Health Toxicology (or online term 2)	WF 3:30-4:50	4
140.xxx	Biostatistics* (or term 3)	Varies	3-4
340.xxx	Epidemiology* (or term 4)	Varies	5
317.600	Introduction to the Risk Sciences & Public Policy (or online term 3)	MW 5:00-6:50	4
550.860	Academic & Research Ethics at JHSPH	Online	0

Second Term

Number	Course	Day/Time	Credits
181.845	MHS Special Studies & Research	NA	1
260.713	R3 Writing Seminar for Graduate Students	W9:00-9:50	1
140.xxx	Biostatistics* (or term 4)	Varies	3-4
180.610	Principles in Environmental Health II	TTh 1:30-3:20	4
Select from focus area electives to reach a minimum of 16 credits			

Third Term

Number	Course	Day/Time	Credits
181.845	MHS Special Studies & Research	NA	2
Select from focus area electives to reach a minimum of 16 credits			

Fourth Term

Number	Course	Day/Time	Credits
181.850	MHS Essay	NA	1
Select from focus area electives to reach a minimum of 16 credits			

*Discuss with your adviser options for meeting the biostatistics and epidemiology course requirements. There are several options ranging from introductory to advanced; choosing between them involves a discussion of student goals, background in these areas, schedule, and area of interest.

Statistics

The program requires two terms of statistics. Typically, this means the following based on focus area:

- FSWES & PM - two-terms of the Stats Reasoning (140.611-12) sequence
- HS & THRA - two terms Stats Methods (140.621-22)
- PEH - three-terms of the Stats Methods sequence (140.621-23)

Note, if students did not do well on the quantitative part of the GREs or in college math, they should take Statistics for Laboratory Scientists I and II (140.615.01-02) in 3rd & 4th terms and meet with TAs.

Epidemiology

The program requires at least one epidemiology course (or sequence):

- FSWES, PM & THRA - Epi Inference in Public Health I and II (340.721-22) in terms 1-2 or online in terms 3-4
- HS & PEH – four terms of epidemiology, modified somewhat to meet their career needs
 - For most, this begins with Epidemiologic Inference in Public Health I & II.
 - Students with an epi foundation or a strong drive to do epi, can enroll in the Epi Methods 1-3 (340.751-53), which is coordinated with the Stats Methods I-III sequence. Professional Epi Methods (340.763) may be taken in Term 3 as an alternative to Epi Methods III.
 - All PEH students take Environmental & Occupational Epidemiology (340.680) 4th Term

MCAT Preparation for Pre-Medicine Students

The school contracts with Kaplan to offer our students a significant discount on MCAT preparation courses. Interested students register through the JHSPH registration system: <https://solutions.jhu.edu/> or directly at the MCAT site: <https://solutions.jhu.edu/mcat>. An email is sent to the department to verify that the student is active and the Kaplan Code is correct with the date. The department approves registration. JHSPH MCAT registration goes to Academic Affairs and registration is shared with KAPLAN and Student Accounts for payment. If you have questions about the med school application process, reach out to Aisha Rivera Margarín (Director of the Occupational & Environmental Medicine Residency).

Cells to Society courses (0.5 credits per course)

Required:	
552.601	Foundational Principles of Public Health
552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health
Select any two from the following:	
552.602	The Role of Quantitative Methods in Public Health
552.604	Causes and Trends in Morbidity and Mortality
552.605	The Science of Primary, Secondary, & Tertiary Prevention in Population Health
552.606	The Critical Importance of Evidence in Advancing Public Health Knowledge
552.608	Biologic, Genetic, and Infectious Bases of Human Disease
552.609	Psychological and Behavioral Factors that Affect a Population's Health
552.610	The Social Determinants of Health
552.611	Globalization and Health: A Framework for Analysis
552.612	Essentials of One Health

ELECTIVE COURSES

First Term

Number	Course	Day/Time	Credits	Focus Area
180.611	Global Environment, Climate Change & Public Health	TTh 8:30-10:20	4	FSWES

180.624	Biotechnology and Health Security	Online	3	HS
180.634	Public Health Emergencies: Risk Communication & Decision Science	Online	3	HS
188.694	Health of Vulnerable Worker Populations	Online	3	HS, PM
188.680	Fundamentals of Occupational Health	Online	3	PM
120.604	Introduction to Molecular Biology	Online	3	PM, TPRA
120.610	Introduction to Biochemistry: Protein Structure and Enzyme Catalysis	Online	3	PM, TPRA

Second Term

Number	Course	Day/Time	Credits	Focus Area
317.610	Risk Policy, Management & Communication	MW 5:00-6:30	3	All
188.688	Global Sustainability and Health Seminar	Th 12:00-1:20	1	FSWES
180.620	An Introduction to Food Systems & Public Health	Online	4	FSWES
180.626	Environmental Justice and Public Health Practice	Online	3	
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH
180.621	Protecting the Environment and Safeguarding Worker Health: A Problem-Based Approach	Online	3	PM
182.623	Occupational Health Management	Online	3	PM
183.631	Fundamentals of Human Physiology	MW 1:30-3:20	4	PM, TPRA
187.632	Molecular Toxicology	MWF 10:30-11:50	4	PM, TPRA
185.805	TPMM Journal Club	M 3:30-4:50	1	TPRA
187.640	Toxicology 21: Scientific Foundations	W 3:30-4:20	1	TPRA

Third Term

Number	Course	Day/Time	Credits	Focus Area
180.624	Biotechnology and Health Security	TTh 9:00-10:20	3	All
120.601	Biochemistry II	MWF 10:30-11:50	5	PM, TPRA
180.635	Seafood and Public Health: Global Trade, Nutrition and the Environment	Online	2	FSWES
180.623	Infectious Disease Threats to Global Health Security	WF 3:30-4:50 or online	3	All
182.640	Food- and Water-borne Diseases	TTh 1:30-2:50	3	All
180.655	Baltimore Food Systems	WF 10:00-11:50	4	FSWES
575.711	Climate Change and Global Environmental Sustainability**	Online (+4 th term)	4.5	FSWES
180.625	Community-driven Epidemiology & Environmental Justice	WF 1:30-2:50	3	FSWES, PEH
180.651	Energy, Environment and Public Health	Online	2	FSWES, PEH
182.626	Issues for Water & Sanitation in Tropical Enviro. Health	T 8:30-10:20	2	HS, PEH

340.701	Epidemiologic Applications of GIS	Online	2	HS, PEH
182.613	Exposure Assessment Techniques for Health Risk Mgmt.	T Th 3:30-4:50 or online	3	HS, TPRA
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH
340.607	Intro to Cardiovascular Disease Epidemiology	MWF 1:30-2:50	4	PEH
317.605	Methods in Quantitative Risk Assessment	MW 5:00-6:50	4	PEH, TPRA
180.640	Molecular Epidemiology & Biomarkers in Public Health	TTh 3:00-4:20	4	PEH, TPRA
188.686	Clinical Environmental and Occupational Toxicology	WF 1:30 - 2:50	3	PM
182.637	Noise and Other Physical Agents in the Environment	Online	4	PM
183.638	Mechanisms of Cardiopulmonary Control	F 3:30-5:20	2	PM, TPRA
187.645	Toxicology 21: Scientific Applications	Online	3	TPRA

*** The Whiting School of Engineering is on a semester schedule (January 25 – May 11) translating to a total of 4.5 credits.*

Fourth Term

Number	Course	Day/Time	Credits	Focus Area
180.630	Chemical and Biological Weapons Threats	Online	3	All
180.636	Human Rights and Health Seminar	W 1:30-3:50	3	All
180.640	Molecular Epidemiology & Biomarkers in Public Health	Online	4	PEH, TPRA
180.644	Food System Resilience to Disasters: COVID-19, Climate Change, and Beyond	Online	2	FSWES
180.647	The Health Effects of Indoor and Outdoor Air Pollution	Online	3	All
180.670	Introduction to Public Health Emergency Preparedness	TTh 9:00-10:20	3	All
185.600	One Health Tools to Promote & Evaluate Healthy & Sustainable Communities	Online	3	All
317.610	Risk Policy, Management & Communication	Online	3	All
183.631	Fundamentals of Human Physiology	Online	4	PM, TPRA
180.606	Case Studies in Food Production & Public Health	Online	4	FSWES
180.651	Energy, Environment and Public Health	Online	2	FSWES, PEH
188.682	A Built Environment for a Healthy and Sustainable Future	Online	3	FSWES
188.688	Global Sustainability and Health Seminar	W 12:00-1:20	1	FSWES
180.628	Intro to Environmental and Occupational Health Law	Online	4	FSWES, PEH, PM
180.633	The Sociocultural Dimensions of Disasters	MW 9:00-10:20	3	HS
182.627	Lessons Learned in the 1918 Pandemic Flu	F 10:30-11:20	1	HS
340.651	Emerging Infections	W 3:30-5:20	2	HS, PM, TPRA
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH

340.680	Environmental and Occupational Epidemiology	MW 1:30-3:20	4	PEH, PM
317.615	Topics in Risk Assessment	M 5:00-6:30	2	PEH, TPRA
317.610	Risk Policy, Management & Communication	Online	3	All
183.642	The Cardiopulmonary System Under Stress	F 3:30-5:20	2	PM, TPRA
187.633	Introduction to Environmental Genomics and Epigenomics	WF 3:30-5:00	3	PM, TPRA
187.661	Environmental Health in Neurological & Mental Disorders	Online	3	PM, TPRA
187.650	Alternative Methods in Animal Testing	Online	3	TPRA
187.655	Evidence-Based Toxicology	Online	3	TPRA
340.688	Practical Epidemiology for Basic Scientists	MWF 1:30-2:20	3	TPRA
187.625	Animals in Research: Law, Policy, and Humane Sciences	Online	3	TPRA

4.3.2 Part-Time MHS

Students should plan to reach the 64-total credit requirement within four years. Please refer to the [course directory](#) for the most current information. If you would like to substitute a recommended course with something not listed, contact the program director. Students may create their own program or they may choose an area of interest:

- **FSWES** – Food Systems, Water & Environmental Sustainability
- **HS** – Health Security
- **PEH** – Population Environmental Health
- **PM** – Medical School Preparation
- **TPRA** – Human Toxicology, Pathophysiology, and Risk Assessment

REQUIRED COURSES

Take the following school-wide required course

Number	Ethics Course	Day/Time	Credits	Term
550.860.82	Academic & Research Ethics at JHSPH	Online	0	1

Take one of the following introductory Environmental Health courses

Number	Introductory Environmental Health Course	Day/Time	Credits	Term
180.609.01	Principles of Environmental Health I	M W 1:30-3:20	4	1
180.601.81	Environmental Health	Online	5	3
180.601.61	Environmental Health	M Tu W Th F, 1:30 - 4:50pm	5	Summer Institute
180.601.01	Environmental Health	M W F, 1:30 - 3:20pm	5	Summer

Take one of the following applied Environmental Health courses (after the above introductory courses)

Number	Applied Environmental Health Course	Day/Time	Credits	Term
180.610.01	Principles of Environmental Health II	TTh 1:30-3:20	4	2
180.610.81	Principles of Environmental Health II	Online	4	2

Take one of the following introductory Toxicology courses

Number	Introductory Toxicology Course	Day/Time	Credits	Term
187.610.01	Public Health Toxicology	W F 3:30-4:50	4	1
187.610.81	""	Online	4	2

Take one of the following introductory Risk Sciences courses

Number	Introductory Risk Sciences Course	Day/Time	Credits	Term
317.600.01	Introduction to the Risk Sciences & Public Policy	M W, 5:00 - 6:50pm	4	1
317.600.81	""	Online	4	3

Take one of the following introductory Epidemiology courses

Number	Introductory Epidemiology Course	Day/Time	Credits	Term
340.721.60	Epidemiologic Inference in Public Health I	M W, 10:30 - 11:20am + lab	5	1
340.721.81	""	Online	5	3
340.721.89	""	Online	5	Summer Inst.
340.751.01	Epidemiologic Methods 1	M W F, 8:30 - 9:50am + lab	5	1
340.618.81	Epidemiology – the Basics	Online	3	4

Take one of the following statistics courses, as well as **the second course in that sequence**

Number	Biostatistics Course	Day/Time	Credits	Term
140.611.01	Statistical Reasoning in Public Health I	MW 5:00-6:50	3	1
140.611.81	""	Online	3	1
140.611.11	""	M Tu W Th F, 1:30 - 4:50pm	3	Summer Institute

Take one of the following writing courses

Number	Writing Course	Day/Time	Credits	Term
260.713.01	R3 Writing Seminar for Graduate Students	W 9:00-9:50	1	2

260.715.81	Unleash Your Writing Superpower: Crafting Clear, Concise and Persuasive Prose	Online	3	2
260.720.81	Communications Primer for the Public Health Sciences	Online	1	1,2,3,4

Take both of the following Cells to Society courses:

Number	Cells to Society Courses	Day/Time	Credits	Term
552.601	Foundational Principles of Public Health	Online	0.5	See schedule
552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population’s Health	Online	0.5	

Select an additional two of the following Cells to Society courses:

Number	Cells to Society Courses	Day/Time	Credits	Term
552.602	The Role of Quantitative Methods in Public Health	Online	0.5	See schedule
552.604	Causes and Trends in Morbidity and Mortality	Online	0.5	
552.605	The Science of Primary, Secondary, & Tertiary Prevention in Population Health	Online	0.5	
552.606	The Critical Importance of Evidence in Advancing Public Health Knowledge	Online	0.5	
552.608	Biologic, Genetic, and Infectious Bases of Human Disease	Online	0.5	
552.609	Psychological and Behavioral Factors that Affect a Population’s Health	Online	0.5	
552.610	The Social Determinants of Health	Online	0.5	
552.611	Globalization and Health: A Framework for Analysis	Online	0.5	
552.612	Essentials of One Health	Online	0.5	

Other

Successful completion of 3 credits related to the MHS Essay is required for completion of the program – 181.845 for two consecutive terms, followed by 1 credit of 181.850. After completing most of the required courses, students should register for the following classes. The registration timeline for these courses is decided between the student and their adviser.

- 181.845 (1 credit) - development and approval of the essay outline and literature review
- 181.845 (2 credit) - development and approval of a final draft of the essay
- 181.850 (1 credit) – 2nd reader approval of the essay and the formal presentation to faculty and students.

5 ScM IN ENVIRONMENTAL HEALTH

Program Director: Megan Latshaw, PhD, MHS

Academic Program Administrator: Katie Phipps, MEd

The ScM degree provides an opportunity to do a year-long research project with a faculty member. The first year of the program follows the MHS guidance above and focuses on coursework designed to provide a strong foundation in environmental health. Instead of writing an essay, first-year ScM students write a research proposal. Similar to the MHS program, ScM students may or may not choose an area of interest.

5.1 PROGRAM REQUIREMENTS

For all ScM students, their research project must represent original work. They should format their first-year product similar to a NIH R21 or F31 research proposal, including an in-depth review of the literature and presenting the key components of the research plan. The proposal fulfills the written portion of the ScM degree requirements and will be presented as part of the MHS/ScM student presentations in early May. It serves as the written basis for the comprehensive oral examination, to be taken as soon as possible after the end of classes in May.

The course 183.840 ScM Special Studies & Research allows the adviser to evaluate the student's progress in completing the proposal and attendance at required meetings. Deadlines for first-year ScM students are the same as deadlines for MHS students (substitute the words 'ScM proposal' for 'MHS essay').

5.1.1 Format of the Proposal

A review of the literature constitutes a large portion of the proposal, providing an introduction and background for the proposed research project. This document should also include a discussion of the relevance of the work to the broader field of environmental health. It will be approximately 20 pages in length (excluding references) and structured as follows:

- I. Introduction and Background – Review of the literature
- II. Research question and specific aims
- III. Research strategy
 - A. Significance, including relevance to environmental health
 - B. Innovation
 - C. Approach
1. Aim
 - a. Experimental design; materials and methods
 - b. Proposed data collection/statistical analyses
 - c. Expected results, potential pitfalls and alternatives
2. Aim(s) (2, 3...)
 1. Experimental design; materials and methods
 2. Proposed data collection/statistical analyses
 3. Expected results, potential pitfalls and alternatives

5.1.2 Comprehensive Examination

The proposal serves as the written component of the examination, as the basis for the presentation, and as the focus of the oral examination. These examinations require the student to demonstrate their knowledge of the proposed research – its rationale, approaches and methodologies – as well as its relevance and potential contributions within the broader perspective of environmental health. Students must submit a completed ScM Comprehensive Examination Form to the academic program administrator at least two weeks before the exam date. Students must pass the comprehensive examination prior to beginning the research year of the program.

The examination committee consists of the research adviser and two to three other faculty members. These members may include someone from outside the department, whose expertise is valuable to the student's project. At least one of these individuals will be identified to serve as a resource to the student and follow their progress through the research year.

The student's adviser serves as chair of the examining committee and will get the student's file from the academic program administrator, prior to the exam. Typically, the student presentation lasts 15-20 minutes, followed by 45-60 minutes of questioning. In private, the committee members vote to pass, pass with conditions, or fail the student. The adviser returns the file to the academic program administrator who then notifies the registrar of the outcome of the exam.

If the exam committee provides conditions required for successful completion of the examination, these must be presented in detail to the student along with the plan for confirming their fulfillment. The conditions must be fulfilled prior to the start of full-time research, unless otherwise decided by the committee. The examination may be re-taken once, if necessary. If the student is unable to successfully pass the examination after a second attempt, the student will be transferred back to the MHS program and be eligible for graduation with that degree. The completed research document will be considered as fulfilling the MHS essay requirement.

5.2 SECOND YEAR

After completing fourth-term coursework and successfully passing the comprehensive exam, the student begins a year-long research project under the direction of their adviser. Some students may work with their adviser over the summer between their first and second year; however, such work does not count toward the degree requirements. During the second year, full-time enrollment must be maintained by taking a minimum of 16 credits of 183.825 ScM Thesis Research in each of the four terms. Students are required to participate in all journal clubs, seminars and meetings deemed necessary by the faculty research adviser. Students will be expected to complete the program at the end of the fourth term of their second year and graduate in May.

Second-year students must have successfully completed 64 credits of coursework to be considered for the [Master's Tuition Scholarship \(MTS\)](#) in the second year. Students must meet all curriculum, grade, Grade Point Average (GPA), and registration requirements. Deadlines for the second year can be found on the [master's candidate page](#); these dates are subject to change each year so the dates in the table are meant to give a general idea for planning purposes. Students should use the master's candidate page for official deadlines and make sure advisers approve of their timeline.

Timeframe	Deliverable
Early March	Verify with the academic program administrator that you are on track to graduate
Early March	Submit first draft of your thesis to adviser for feedback
Late March	Submit thesis reader appointment form to the Office of Records & Registration
Early April	Submit final draft of your thesis to your adviser
Late April	Submit thesis to JHU Electronic Thesis or Dissertation (ETD) system
Early May	MHS/ScM Presentations
Mid May	Submit comprehensive examination form to the academic program administrator

5.2.1 Research and Thesis Requirements

The ScM degree requires successful completion of a research project and the writing of a master's thesis based on that work. The research will be completed under the direction of a faculty mentor (research adviser) who is a member of the Department of Environmental Health and Engineering. The work must represent an original hypothesis-driven investigation on a topic of interest to the student and agreed upon by the adviser. The format will adhere to University guidelines which can be found on the [Johns Hopkins Sheridan Libraries website](#). The document quality must be suitable for publication in a peer-reviewed scientific journal.

5.2.2 Appointment of the Committee of Thesis Readers

The thesis committee comprises the student's research adviser and at least one other faculty member from any department within the Johns Hopkins University. Only one committee member may be an adjunct; the other(s) must be full-time (professor, scientist, lecturer, instructor of any rank). Emeriti faculty may serve on the committee; however, visiting faculty may not. The student and research adviser should identify the second thesis reader and obtain their agreement to serve on the committee.

Once a thesis reader has agreed to serve on the committee, the student must submit a [thesis reader appointment form](#) to the academic program administrator at least one month before the student expects to complete the degree. The form requires the signatures of the research adviser, department chair, and academic program administrator; it certifies that the student has completed all school and departmental requirements for the degree, except for the thesis.

The student is responsible for distributing the thesis to their research adviser and the thesis reader at least four weeks before the student expects to complete the degree. The adviser and thesis reader should review the thesis in a timely manner and send a letter to the student listing any recommended changes. The thesis reader will also send the adviser a copy of the letter. It is the responsibility of the

adviser to adjudicate suggested revisions and approve the final version of the thesis. The adviser will then submit a letter to that effect to the registrar. Completion of the degree is not finalized until the registrar receives letters from the adviser and thesis reader approving the thesis, and the student submits an electronic version of the dissertation to the [JHU Electronic Theses & Dissertations \(ETD\) system](#).

5.2.3 Presentation

Students are required to present their research during the MHS & ScM Student Presentations in May. Presentations should be 20 minutes in length followed by 10 minutes of questions and answers from faculty and students. The academic program administrator will work with students to schedule the presentations.

The Department requests one bound copy of the thesis; all copies are placed in W7023. The School recommends using [Thesis on Demand](#). The binding should be black and include the students name, degree, and year on the spine; the thesis title and name on the front.

5.3 POLICIES

In addition to program- and department-level policies, students are responsible for following [School-](#) and [University-level policies](#).

5.3.1 Advisers

All master's students will be assigned an adviser, who serves as the primary contact for the Department, assists the student with course selection each term, approves their essay or thesis, and helps interpret Departmental and School policies. The student is free to change advisers, but this change must be approved by the program director and sent to the academic program administrator via email.

5.3.2 Assessment of Progress

Students must meet minimum academic standards to remain in the master's program. Each term the student should review grades from the previous term with their adviser. Specific goals will be determined following this review. A student who is experiencing academic difficulty will be notified in writing if they are expected to achieve a specific GPA during the upcoming term. Failure to meet any of the following criteria is grounds for dismissal from the program.

5.3.3 Cumulative GPA

The School requires master's students to maintain a minimum 2.75 cumulative grade point average. Students with a GPA falling below 2.75 will be placed on academic warning and will have one term of registration in which to raise their GPA above the threshold for their degree. The academic program administrator will notify students placed on academic warning and their performance will be reviewed by the Educational Programs Committee (EPC). All recommendations about academic standing will be then presented to the Department's Executive Committee for final disposition.

Students not meeting the minimum GPA after one term may be granted additional term(s) on academic warning if academic progress has been shown in the cumulative GPA; that approval beyond one term must be reported to the School's Committee on Academic Standards. Students on academic warning must meet with their academic adviser and program director (or academic program administrator) each

term to review their academic plan and receive approval for their course schedule prior to registering for courses. Students with a cumulative GPA below the minimum may not register for more than 18 credits per term. Any repeated courses count towards this 18-credit limit.

5.3.4 Grades in Core Courses

Students must earn a minimum grade on a set of required program-specific core courses: “Pass” for courses offered only on a pass/fail basis; “C” or higher for master’s students for courses offered for letter grading. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the program director. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School’s Committee on Academic Standards.

5.3.5 Registration

It is the student’s responsibility to register for courses during the appropriate time periods specified by the [Office of Records and Registration](#) (and available on the [academic calendar](#)). Students are expected to discuss course plans with their adviser before registration and confirm registration details with their adviser every term. Regardless of funding sources such as grants, stipends, etc., students are responsible for any applicable fees if they do not register properly.

5.3.6 Course Waivers

A waiver request will be considered when a student has taken a similar, graduate-level course(s), with a passing grade, in another division of JHU or another university. A waiver will not be granted for courses in which the student received less than a B, or did not receive a letter grade. Please note that the approval of a waiver does not reduce the total number of credits a student is required to earn to meet graduation requirements. Students should [complete the form](#) and attach supporting documentation (i.e. syllabus).

Waivers and substitutions are only approved by the student matters subcommittee, not the adviser. The academic program administrator will notify the student of the outcome and a copy of the form will be kept in the students’ academic file.

5.3.7 Funding

Partial tuition support is available for students enrolled full-time in the ScM program. Eligibility for the [Master’s Tuition Scholarship](#) (MTS) requires students are in good academic standing and pay tuition for at least 64 approved credits. In addition, ScM students must complete at least 12 credits of formal coursework outside of EHE. At least six of these credits must be taken in the School of Public Health. The MTS is worth up to 75% off tuition.

All qualified applicants are considered for scholarship opportunities. In most cases, admitted students will be notified at the time of acceptance if they are awarded any type of financial support with the amount and type of support specified in the award notification. Students should contact the EHE Business Office if they have any questions about their award or accounts. Students are encouraged to visit the School’s website for [funding opportunities](#) and [funding resources](#).

5.4 ScM CURRICULUM

Each term, students should register for at least 16 credits in order to reach the 64-total credit requirement. Students reach this 16-credit per-term minimum by first registering for the required courses, then choosing among the elective courses. Some sections may be available online. Please refer to the [course directory](#) for the most current information. If you would like to substitute a recommended course with something not listed, contact the program director. Students may create their own program or they may choose an area of interest:

- **FSWES** – Food Systems, Water & Environmental Sustainability
- **HS** – Health Security
- **PEH** – Population Environmental Health
- **PM** – Medical School Preparation
- **TPRA** – Human Toxicology, Pathophysiology, and Risk Assessment

First Term

Number	Course	Day/Time	Credits
180.609	Principles of Environmental Health I	MW 1:30-3:20	4
187.610	Public Health Toxicology (or online term 2)	WF 3:30-4:50	4
140.xxx	Biostatistics* (or term 3)	Varies	3-4
340.xxx	Epidemiology* (or term 4)	Varies	5
317.600	Introduction to the Risk Sciences & Public Policy (or online term 3)	MW 5:00-6:50	4
550.860	Academic & Research Ethics at JHSPH	Online	0

Second Term

Number	Course	Day/Time	Credits
183.845	ScM Special Studies & Research	NA	1
260.713	R3 Writing Seminar for Graduate Students	W9:00-9:50	1
140.xxx	Biostatistics* (or term 4)	Varies	3-4
180.610	Principles in Environmental Health II	TTh 1:30-3:20	4
Select from electives to reach a minimum of 16 credits			

Third Term

Number	Course	Day/Time	Credits
183.845	ScM Special Studies & Research	NA	2
Select from focus area electives to reach a minimum of 16 credits			

Fourth Term

Number	Course	Day/Time	Credits
183.845	ScM Special Studies & Research	NA	1
Select from focus area electives to reach a minimum of 16 credits			

Cells to Society courses (0.5 credits per course)

Required:	
552.601	Foundational Principles of Public Health
552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health
Select any two from the following:	
552.602	The Role of Quantitative Methods in Public Health
552.604	Causes and Trends in Morbidity and Mortality
552.605	The Science of Primary, Secondary, & Tertiary Prevention in Population Health
552.606	The Critical Importance of Evidence in Advancing Public Health Knowledge
552.608	Biologic, Genetic, and Infectious Bases of Human Disease
552.609	Psychological and Behavioral Factors that Affect a Population's Health
552.610	The Social Determinants of Health
552.611	Globalization and Health: A Framework for Analysis
552.612	Essentials of One Health

Year 2 - Terms 1-4

Number	Course	Day/Time	Credits
183.825	ScM Thesis Research	NA	16

ELECTIVES

First Term

Number	Course	Day/Time	Credits	Focus Area
180.611	Global Environment, Climate Change & Public Health	TTh 8:30-10:20	4	FSWES
180.624	Biotechnology and Health Security	Online	3	HS
180.634	Public Health Emergencies: Risk Communication & Decision Science	Online	3	HS
188.694	Health of Vulnerable Worker Populations	Online	3	HS, PM
188.680	Fundamentals of Occupational Health	Online	3	PM
120.604	Introduction to Molecular Biology	Online	3	PM, TPRA
120.610	Introduction to Biochemistry: Protein Structure and Enzyme Catalysis	Online	3	PM, TPRA

Second Term

Number	Course	Day/Time	Credits	Focus Area
317.610	Risk Policy, Management & Communication	MW 5:00-6:30	3	All
188.688	Global Sustainability and Health Seminar	Th 12:00-1:20	1	FSWES
180.620	An Introduction to Food Systems & Public Health	Online	4	FSWES
180.626	Environmental Justice and Public Health Practice	Online	3	
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH
180.621	Protecting the Environment and Safeguarding Worker Health: A Problem-Based Approach	Online	3	PM
182.623	Occupational Health Management	Online	3	PM
183.631	Fundamentals of Human Physiology	MW 1:30-3:20	4	PM, TPRA
187.632	Molecular Toxicology	MWF 10:30-11:50	4	PM, TPRA
185.805	TPMM Journal Club	M 3:30-4:50	1	TPRA
187.640	Toxicology 21: Scientific Foundations	W 3:30-4:20	1	TPRA

Third Term

Number	Course	Day/Time	Credits	Focus Area
180.624	Biotechnology and Health Security	TTh 9:00-10:20	3	All
120.601	Biochemistry II	MWF 10:30-11:50	5	PM, TPRA
180.635	Seafood and Public Health: Global Trade, Nutrition and the Environment	Online	2	FSWES
180.623	Infectious Disease Threats to Global Health Security	WF 3:30-4:50 or online	3	All
182.640	Food- and Water-borne Diseases	TTh 1:30-2:50	3	All
180.655	Baltimore Food Systems	WF 10:00-11:50	4	FSWES

575.711	Climate Change and Global Environmental Sustainability**	Online (+4 th term)	4.5	FSWES
180.625	Community-driven Epidemiology & Environmental Justice	WF 1:30-2:50	3	FSWES, PEH
180.651	Energy, Environment and Public Health	Online	2	FSWES, PEH
182.626	Issues for Water & Sanitation in Tropical Enviro. Health	T 8:30-10:20	2	HS, PEH
340.701	Epidemiologic Applications of GIS	Online	2	HS, PEH
182.613	Exposure Assessment Techniques for Health Risk Mgmt.	T Th 3:30-4:50 or online	3	HS, TPRA
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH
340.607	Intro to Cardiovascular Disease Epidemiology	MWF 1:30-2:50	4	PEH
317.605	Methods in Quantitative Risk Assessment	MW 5:00-6:50	4	PEH, TPRA
180.640	Molecular Epidemiology & Biomarkers in Public Health	TTh 3:00-4:20	4	PEH, TPRA
188.686	Clinical Environmental and Occupational Toxicology	WF 1:30 - 2:50	3	PM
182.637	Noise and Other Physical Agents in the Environment	Online	4	PM
183.638	Mechanisms of Cardiopulmonary Control	F 3:30-5:20	2	PM, TPRA
187.645	Toxicology 21: Scientific Applications	Online	3	TPRA

** The Whiting School of Engineering is on a semester schedule (January 25 – May 11) translating to a total of 4.5 credits.

Fourth Term

Number	Course	Day/Time	Credits	Focus Area
180.630	Chemical and Biological Weapons Threats	Online	3	All
180.636	Human Rights and Health Seminar	W 1:30-3:50	3	All
180.640	Molecular Epidemiology & Biomarkers in Public Health	Online	4	PEH, TPRA
180.644	Food System Resilience to Disasters: COVID-19, Climate Change, and Beyond	Online	2	FSWES
180.647	The Health Effects of Indoor and Outdoor Air Pollution	Online	3	All
180.670	Introduction to Public Health Emergency Preparedness	TTh 9:00-10:20	3	All
185.600	One Health Tools to Promote & Evaluate Healthy & Sustainable Communities	Online	3	All
317.610	Risk Policy, Management & Communication	Online	3	All
183.631	Fundamentals of Human Physiology	Online	4	PM, TPRA
180.606	Case Studies in Food Production & Public Health	Online	4	FSWES
180.651	Energy, Environment and Public Health	Online	2	FSWES, PEH

188.682	A Built Environment for a Healthy and Sustainable Future	Online	3	FSWES
188.688	Global Sustainability and Health Seminar	W 12:00-1:20	1	FSWES
180.628	Intro to Environmental and Occupational Health Law	Online	4	FSWES, PEH, PM
180.633	The Sociocultural Dimensions of Disasters	MW 9:00-10:20	3	HS
182.627	Lessons Learned in the 1918 Pandemic Flu	F 10:30-11:20	1	HS
340.651	Emerging Infections	W 3:30-5:20	2	HS, PM, TPRA
185.801	ESEE Journal Club	M 12:00-1:20	1	PEH
340.680	Environmental and Occupational Epidemiology	MW 1:30-3:20	4	PEH, PM
317.615	Topics in Risk Assessment	M 5:00-6:30	2	PEH, TPRA
317.610	Risk Policy, Management & Communication	Online	3	All
183.642	The Cardiopulmonary System Under Stress	F 3:30-5:20	2	PM, TPRA
187.633	Introduction to Environmental Genomics and Epigenomics	WF 3:30-5:00	3	PM, TPRA
187.661	Environmental Health in Neurological & Mental Disorders	Online	3	PM, TPRA
187.650	Alternative Methods in Animal Testing	Online	3	TPRA
187.655	Evidence-Based Toxicology	Online	3	TPRA
340.688	Practical Epidemiology for Basic Scientists	MWF 1:30-2:20	3	TPRA
187.625	Animals in Research: Law, Policy, and Humane Sciences	Online	3	TPRA

6 MS IN GEOGRAPHY AND ENVIRONMENTAL ENGINEERING

The MS in Geography and Environmental Engineering requires a minimum of two semesters of coursework. MS students have the option to complete an independent research project, submitted as a formal essay. An additional one to two semesters are typically required to complete the degree with a research project. The MS degree is open to students with undergraduate degrees in engineering, mathematics, biology, chemistry, physics, geology and other scientific disciplines. MS students can choose from two tracks within the program: Environmental Science, or Environmental Science and Policy. MS students may also follow the tracks within the MSE degree program. Each individual's program of study is planned by the student in consultation with department faculty and must be approved by the faculty adviser.

6.1 POLICIES

6.1.1 Advisers

All new master's students will be assigned an adviser before their arrival. The adviser serves as the primary contact for the Department and will assist the student with course selection each term as well as interpretation of Departmental and School policies. Master's students in the Geography and Environmental Engineering program who choose to complete a research project as a part of their degree may choose a research adviser separate from their adviser.

6.1.2 Assessment of Progress

Each semester the student and their adviser will review grades from the previous term. Specific goals will be determined following this review. Students must meet minimum academic standards to remain in the master's program. A student who is experiencing academic difficulty will be notified in writing if they are expected to achieve a specific GPA during the upcoming term. Failure to meet any of the following criteria is grounds for dismissal from the program.

6.1.3 Grades in Core Courses

Students must earn a minimum grade on a set of required program-specific core courses: "Pass" for courses offered only on a pass/fail basis; "C" or higher for master's students for courses offered for letter grading. Students are permitted to apply up to two classes with a grade of "C" toward their degree. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the program director.

6.2 CONCENTRATION IN ENVIRONMENTAL SCIENCE

The concentration in Environmental Science provides a broad yet rigorous background for environmental professionals. Using the department's areas of interest, study and research as guides and in consultation with their advisers, MS students can construct their own concentration that complements and expands their interests and professional goals. Additionally, MS students can choose

to follow or pull from the MSE concentration tracks: Contaminant Fate & Transport, Environmental Management and Economics, Environmental Process Engineering, Data Science and Analytics for Environmental Health and Engineering, and Water Resources Engineering.

6.2.1 Degree Program Requirements

- A minimum of 30 credits including no more than 1 credit of seminar, 1 credit of intercession course work, 1.5 credits from the Center for Leadership Education (with adviser approval) and 6 credits of independent research counting toward the 30 credits
- At least 50 percent of the 30 credits must come from courses within the department
- Students are permitted to apply up to two classes with a grade of “C” toward their degree. No classes with “D” or “F” can be applied
- Five to six required courses and four to five recommended elective courses depending on track (note: in order to substitute an alternate course for a recommended elective, students must receive written approval from their adviser)
- Prerequisites (required) for the MSE program includes mathematics through differential equations and computing skills.
- AAP ([Advanced Academic Programs](#)) or EP ([Engineering for Professionals](#)) courses can be taken and counted to receive a master’s degree as long as there is sufficient rigor as deemed by the adviser. Students must have written consent from their adviser (an email will suffice) prior to signing up for the course.
- The Whiting School of Engineering strongly discourages master’s students from using 300-level courses to count towards the required number of master’s graduation credits. Exceptions to this rule should be reviewed on a case-by-case basis by the department. No more than two 300-level courses can be used to count towards the 30 master’s-level credits required for graduation. Advisers must provide an email to the academic program administrator to be kept in the student’s file. The email must indicate:
 - The 300-level course has been reviewed and deemed to have acceptable rigor, and
 - Where applicable, identifying the name and course number of the class that the 300-level course will replace

6.2.2 Program Course Requirements

To complete this concentration, it is recommended to take four courses in environmental science. Suggestions include:

- EN.570.644 Physical and Chemical Processes I
- EN.570.648 Physical and Chemical Processes II
- EN.575.706 Biological Processes for Water and Wastewater Treatment

The other environmental science courses should be chosen from the following:

- EN.570.615 Current Trends in Environmental Microbiology
- EN.570.643 Aquatic and Biofluid Chemistry
- EN.575.645 Environmental Microbiology
- EN.570.691 Hazardous Waste Engineering and Management

6.3 CONCENTRATION IN ENVIRONMENTAL SCIENCE AND POLICY

The concentration in Environmental Science and Policy provides a broad yet rigorous background for environmental professionals.

Using the department's areas of interest, study, and research as guides and in consultation with their advisers, MS students can construct their own concentration that complements and expands their interests and professional goals incorporating economics and systems courses. Additionally, MS students can choose to follow or pull from the MSE concentration tracks: Contaminant Fate & Transport, Environmental Management and Economics, Environmental Process Engineering and Water Resources Engineering.

6.3.1 Degree Program Requirements

- A minimum of 30 credits including no more than 1 credit of seminar, 1 credit of intercession course work, 1.5 credits from the Center for Leadership Education (with adviser approval) and 6 credits of independent research counting toward the 30 credits
- At least 50 percent of the 30 credits must come from courses within the department
- Students are permitted to apply up to two classes with a grade of "C" toward their degree. No classes with "D" or "F" can be applied
- Five to six required courses and four to five recommended elective courses depending on track (note: in order to substitute an alternate course for a recommended elective, students must receive written approval from their adviser)
- Prerequisites (required) for the MSE program includes mathematics through differential equations and computing skills.
- AAP ([Advanced Academic Programs](#)) or EP ([Engineering for Professionals](#)) courses can be taken and counted to receive a master's degree as long as there is sufficient rigor as deemed by the adviser. Students must have written consent from their adviser (an email will suffice) prior to signing up for the course.
- The Whiting School of Engineering strongly discourages master's students from using 300-level courses to count towards the required number of master's graduation credits. Exceptions to this rule should be reviewed on a case-by-case basis by the department. No more than two 300-level courses can be used to count towards the 30

master's-level credits required for graduation. Advisers must provide an email to the academic program administrator to be kept in the student's file. The email must indicate:

- The 300-level course has been reviewed and deemed to have acceptable rigor, and
- Where applicable, identifying the name and course number of the class that the 300-level course will replace

6.3.2 Program Track Course Requirements

Core courses in environmental policy include:

- EN.570.695 Optimization Foundations for Environmental Engineering and Policy Design
- EN.570.697 Risk and Decision Analysis

Choose at least two from the following:

- EN.575.645 Environmental Microbiology
- EN.570.633 Hydrologic Processes and Modeling
- EN.570.643 Aquatic and Biofluid Chemistry
- EN.570.691 Hazardous Waste Engineering and Management

Choose at least one of the following:

- PH.317.605 Methods in Quantitative Risk Assessment
- EN.570.607 Energy Policy and Planning Models
- EN.570.657 Air Pollution
- EN.570.616 Data Analytics in Environmental Health and Engineering

Additional recommended courses:

- EN.570.644 Physical and Chemical Processes I
- EN.570.648 Physical and Chemical Processes II

The final courses will be a project or electives in environmental science, engineering, policy, statistics or systems that are appropriate to the student's goals and approved by a faculty adviser.

7 MS IN OCCUPATIONAL AND ENVIRONMENTAL HYGIENE

The Master of Science (MS) in Occupational and Environmental Hygiene (OEH) program is a professional degree designed for students interested in developing or advancing professional careers in occupational and environmental risk assessment and management. This program is part of the Department's NIOSH-sponsored Education and Research Center in Occupational Safety and Health. Graduates of the program are employed in consulting, private industry and/or government, and they are also prepared to pursue doctoral studies in environmental health sciences.

The OEH program has four broad educational objectives:

1. Recognize, evaluate, and control factors in the workplace and the environment that may cause illness, injury, or impairment;
2. Develop functional skills in five core areas identified for professional programs (biostatistics, epidemiology, administration, education/behavioral sciences, and environmental health) specific to the practice of occupational and environmental hygiene.
3. Prepare for an immediate career through comprehensive education and training; and
4. Provide a breadth of professional knowledge needed to pursue further education in environmental health.

For students particularly interested in careers in occupational hygiene the program is accredited by the Applied and Natural Science Accreditation Commission (ANSAC) of the Accreditation Board for Engineering and Technology (ABET), and is designed to prepare students for the Certified Industrial Hygienist (CIH) examination administered by the American Board of Industrial Hygiene (ABIH). Training in the program covers principles of risk assessment and management in the workplace and in the general environment. Coursework includes toxicology, epidemiology, biostatistics, occupational health, occupational and environmental hygiene, air pollution, environmental sampling, exposure assessment, and program management, as well as risk assessment, risk management and risk communication.

7.1 INTERNSHIP OR INDEPENDENT PROFESSIONAL PROJECT & ESSAY REQUIREMENT

As a requirement of the MS OEH program, each student must complete an independent professional project (IPP) and write a culminating essay that is presented in a formal seminar. The IPP can be completed as part of the internship experience for full-time students or in the context of a student's employment for part-time students. The essay is intended to serve as an integrating experience for the students. The content is based on an occupational or environmental health problem that is pertinent to the educational goals of the student and approved by the advisor. The essay is typically the product of an internship or employment experience. The essay represents a substantive application of professional technical skills through the process of collecting and summarizing data and reviewing appropriate literature. Where possible, students are encouraged to pursue projects that can lead to a publishable manuscript.

This program includes a three-month internship. The internship is designed to provide professional experience tailored to the needs and interests of each student. During the internship, the student is expected to assume independent responsibility for a project, which is described in a culminating paper that serves as a review of the entire educational experience. Internship placements for full-time students are evaluated by asking field mentors to evaluate the student performance and each student to evaluate their internship. Students will register for 182.810 MS Field Placement.

Students Seeking Additional Research/Internship Opportunities

Additional laboratory and internship opportunities are assessed on a case-by-case basis and should be discussed with your advisor before starting any work. Students who would like credit for working in a faculty lab can register for 182.845. Students who would like credit for additional internship hours outside of JHU can enroll in 182.810. This is applicable both for domestic students and international students who need to meet visa requirements.

7.2 CURRICULUM

The curriculum for Occupational and Environmental Hygiene is housed at Bloomberg School of Public Health. Please note that the school schedules all courses by term rather than semester.

FIRST YEAR REQUIREMENTS

First Term

- PH.140.621 Statistical Methods in Public Health I
- PH.340.721 Epidemiologic Inference in Public Health I
- PH.187.610 Public Health Toxicology
- PH.188.680 Fundamentals of Occupational Health
- PH.182.845 MS Special Studies and Research

Second Term

- PH.140.622 Statistical Methods in Public Health II
- PH.182.621 Introduction to Ergonomics
- PH.182.614 Industrial Hygiene Laboratory
- PH.182.625 Principles of Occupational and Environmental Hygiene
- PH.182.845 MS Special Studies and Research

Third Term

- PH.140.623 Statistical Methods in Public Health III
- PH.182.623 Occupational Health Management
- PH.182.613 Exposure Assessment Techniques for Health Risk Management

- PH.182.845 MS Special Studies and Research
- Electives

Fourth Term

- PH.180.628 Introduction to Environmental and Occupational Health Law
- PH.305.615 Occupation Injury Prevention and Safety Policy and Practice
- PH.188.681 Onsite Evaluation of Workplace and Occupational Health Programs
- PH.182.845 MS Special Studies and Research
- Electives

Summer - No registration required

SECOND YEAR REQUIREMENTS

First Term (fifth term of program)

- PH.182.631 Principles of Occupational Safety
- PH.182.615 Airborne Particles
- PH.317.600 Introduction to the Risk Sciences and Public Policy
- PH.182.810 MMs Field Placement
- PH.182.850 MS Essay
- PH.182.845 MS Special Studies and Research
- Electives

Second Term (sixth term of program)

- PH.182.637 Noise and Other Physical Agents in the Environment
- PH.317.610 Risk Policy, Management and Communication
- PH.182.850 MS Essay
- PH.182.845 MS Special Studies and Research
- Electives

In addition, all students are required to complete 550.860.82 Academic & Research Ethics. This online course must be completed during the first term after matriculation.

Note: It is permissible to substitute the online versions of noted courses in place of the face-to-face versions. Online versions of courses are usually offered in different terms and may require rearrangement of other courses. Check with your adviser.

8 MS IN TOXICOLOGY FOR HUMAN RISK ASSESSMENT

Program Director: Joseph Bressler, PhD

Academic Program Administrator: Katie Phipps, MEd

The Master of Science in Toxicology for Human Risk Assessment is intended for students interested in risk assessment. The degree emphasizes the integration of traditional in vivo models and emerging in vitro and in silico models. Regulators and risk assessors are incorporating these new toxicity testing modalities into their work. Graduates will be prepared to play an essential role in the scientific evaluation of toxicity testing data. Students completing the program will also fulfill the requirements to earn the [Certificate in Risk Sciences and Public Policy](#).

Upon completion of the program, students will be able to:

- Explain and interpret epidemiologic studies to support risk assessment and decision making;
- Elaborate commonly used public health measures, such as relative risk, attributable risk and relative hazards, and select appropriate statistical methods for estimating such measures in the presence of covariates;
- Interpret descriptive and inferential statistics resulting from data analysis and draw relevant conclusions;
- Interpret studies that use bioinformatic techniques;
- Evaluate and interpret traditional toxicological studies;
- Elaborate novel methodological approaches in toxicology;
- Apply and integrate epidemiological, traditional and novel toxicological studies to support risk assessment;
- Define the major environmental agents (i.e., environmental chemical, biological, and physical that cause adverse effects on human health) and their sources, natural and anthropomorphic;
- Discuss the transport and fate of major environmental agents in the environment, and identify the carriers or vectors (air, water, soil, and food) that promote the transfer of these agents from various environments (e.g. occupational setting) to the human;
- Describe the toxicokinetics of major environmental agents including routes of entry, metabolism, storage, and excretion;
- Describe the toxicodynamics of major environmental agents, including toxicological pathways and the mechanisms by which agents exert adverse health effects, and the use of in vitro models for predicting the magnitude of adverse effects;
- Describe approaches for in vitro to in vivo modeling of toxicokinetics;
- Summarize areas of emerging science for risk assessment (personalized toxicology, chemical mixture toxicology, systems toxicology, multi-natured stressor mixtures);

- Use systematic approaches for combining and evaluating toxicokinetic and toxicodynamic evidence;
- Evaluate evidence-based toxicology studies and studies conducted using other systematic approaches;
- Utilize exposure and epidemiologic and traditional and novel toxicological data to conduct a risk assessment;
- Communicate and translate science to general audiences and policymakers;
- Describe key risk management practices in the US and internationally;
- Explain the application of evidence used to make environmental health decisions, setting of standards and guidance;
- Summarize the function of federal agencies in public health practices and decision making.

The full-time program consists of nine months of coursework of the fundamental concepts and testing approaches used in classic risk assessment processes, as well as those used in the [new paradigm for toxicity in the 21st Century](#), and a seven- to twelve-month internship with a government agency, non-governmental organization, industry, or private sector group

8.1 PROGRAM REQUIREMENTS

8.1.1 Coursework

The curriculum consists of core courses that will be taken during the first year of the program, during the four 8-week terms from September to mid-May. The internship and capstone essay will be completed in the second year.

Students must meet minimum satisfactory academic standards to remain in the MS program. To meet these standards, students must:

1. Maintain a minimum of 2.75 cumulative grade point average
2. Retake a required course in which they receive a grade of "D" or "F"

If a student receives a grade of "D" or "F" twice in the same required course, they may not repeat the course a third time. If the course is a required core course with no other options, the student will be dismissed from the program.

8.1.2 Internship

Students in this professional degree program assume responsibility for a professional project to be carried out off-site at a governmental agency, non-governmental organization, industry or private sector company. Students will work with the faculty adviser to identify internship opportunities. The minimum duration of the internship will be four months (two academic terms) in conjunction with 32 course credits of 182.810 MS Field Placement. The student will be directed in the internship experience by an on-site mentor and will regularly communicate with their academic adviser. The overall length of the project period may be extended beyond the minimum requirement.

8.1.3 Essay and Presentation

Students in professional programs at the Johns Hopkins School of Public Health must successfully submit a culminating project that demonstrates integration of the skills developed during the coursework and internship experiences. For students in the MS program, this project takes the form of an in-depth capstone essay.

The topic of the essay will be linked to the specific or general focus of the internship experience and will be chosen in consultation with the adviser, who must approve it. Students are encouraged to select a topic that will lend itself to publication in a scientific journal. Following approval of the essay, students will be required to make a formal oral presentation to the Department.

Essay Format

- Title page
- Abstract (1 page)
- Table of contents/list of figures
- Introduction/background (approx. 5-10 pages) - Include objectives of the project and explain the significance of the objectives
- Methods (approx. 5-8 pages)
- Results (approx. 4-8 pages)
- Discussion and Conclusions (approx. 5-10 pages) - In addition to discussing the results, include the steps your organization would be taking to continue the project. Also, describe the benefit of the project to industry, government (local, state and/or federal), and the regulatory community.
- References - refer to the PNAS style, which includes published articles, books and websites

8.2 MILESTONES FOR DECEMBER 2021 DEGREE CONFERRAL

(S) – student responsibility, (F) – faculty responsibility

July 1 (or one month after beginning the internship) – An organizational meeting will be conducted that includes the student, internship adviser, and the program adviser. A draft of the introduction is submitted prior to the meeting (S).

July 16 – Project approved and data collection begins (F)

Sept. 1 – Paper outline is submitted to program adviser (S)

Sept. 15 – Comments from adviser are due (F)

Oct. 1 – First draft is submitted (S)

Oct. 15 – Comments from adviser are due (F)

Nov. 1 – Second draft is submitted (S)

Nov. 15 – Comments from program adviser are due (F)

Dec. 1 – Final draft is submitted (S)

Dec. 15 – Completion letter is signed (F)

TBA – 30-minute presentation to MS faculty (S, F)

8.3 POLICIES

In addition to program- and department-level policies, students are responsible for following [School-](#) and [University-level policies](#).

8.3.1 Advisers

All master's students will be assigned an adviser, who serves as the primary contact for the Department, assists the student with course selection each term, approves their essay or thesis, and helps interpret Departmental and School policies. The student is free to change advisers, but this change must be approved by the program director and sent to the academic program administrator via email.

8.3.2 Assessment of Progress

Students must meet minimum academic standards to remain in the master's program. Each term the student should review grades from the previous term with their adviser. Specific goals will be determined following this review. A student who is experiencing academic difficulty will be notified in writing if they are expected to achieve a specific GPA during the upcoming term. Failure to meet any of the following criteria is grounds for dismissal from the program.

8.3.3 Cumulative GPA

The School requires master's students to maintain a minimum 2.75 cumulative grade point average. Students with a GPA falling below 2.75 will be placed on academic warning and will have one term of registration in which to raise their GPA above the threshold for their degree. The academic program administrator will notify students placed on academic warning and their performance will be reviewed by the Educational Programs Committee (EPC). All recommendations about academic standing will be then presented to the Department's Executive Committee for final disposition. Students not meeting the minimum GPA after one term may be granted additional term(s) on academic warning if academic progress has been shown in the cumulative GPA; that approval beyond one term must be reported to the School's Committee on Academic Standards. Students on academic warning must meet with their academic adviser and program director (or academic program administrator) each term to review their academic plan and receive approval for their course schedule prior to registering for courses. Students with a cumulative GPA below the minimum may not register for more than 18 credits per term. Any repeated courses count towards this 18-credit limit.

8.3.4 Grades in Core Courses

Students must earn a minimum grade on a set of required program-specific core courses: "Pass" for courses offered only on a pass/fail basis; "C" or higher for master's students for courses offered for letter grading. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the program

director. A grade below the threshold on the second attempt may be grounds for dismissal and must be reported to the School’s Committee on Academic Standards.

8.3.5 Registration

It is the student’s responsibility to register for courses during the appropriate time periods specified by the [Office of Records and Registration](#) (and available on the academic calendar). Students are expected to discuss course plans with their adviser before registration and confirm registration details with their adviser every term. Regardless of funding sources such as grants, stipends, etc., students are responsible for any applicable fees if they do not register properly.

8.3.6 Course Waivers

A waiver request will be considered when a student has taken a similar, graduate-level course(s), with a passing grade, in another division of JHU or another university. A waiver will not be granted for courses in which the student received less than a B, or did not receive a letter grade. Please note that the approval of a waiver does not reduce the total number of credits a student is required to earn to meet graduation requirements. Students should [complete the form](#) and attach supporting documentation (i.e. syllabus).

Waivers and substitutions are only approved by the student matters subcommittee, not the adviser. The academic program administrator will notify the student of the outcome and a copy of the form will be kept in the students’ academic file.

8.3.7 Funding

Partial tuition support is available for students enrolled full-time in the MS program. Eligibility for the [Master’s Tuition Scholarship](#) (MTS) requires students are in good academic standing and pay tuition for at least 64 approved credits. In addition, MS students must complete at least 12 credits of formal coursework outside of EHE. At least six of these credits must be taken in the School of Public Health. The MTS is worth up to 75% off tuition.

8.4 MS CURRICULUM

Year 1 - First Term

Number	Course	Time	Credits
550.860	Academic & Research Ethics at JHSPH	Online	0
180.609	Principles of Environmental Health I	M W 1:30-3:20	4
187.610	Public Health Toxicology	W F 3:30-4:50	4
317.600	Introduction to the Risk Sciences & Public Policy	M W 5:00-6:50	4
340.721	Epidemiologic Inference in Public Health I	Online	5
140.621	Statistical Methods in Public Health I	Online	4

Second Term

Number	Course	Time	Credits
187.640	Toxicology 21: Scientific Foundations	W 3:30-4:20	1
187.632	Molecular Toxicology	MWF 10:30-11:50	4
317.610	Risk Policy, Management and Communication	MW 5:00-6:30	3
140.622	Statistical Methods in Public Health II	Online	4

340.722	Epidemiologic Inference in Public Health II	M F 9:00-10:20	4
552.603	The Role of Qualitative Methods and Science in Describing and Assessing a Population's Health	Online	0.5
552.601	Foundational Principles of Public Health	Online	0.5

Third Term

Number	Course	Time	Credits
187.645	Toxicology 21: Scientific Application	Online	3
317.605	Methods in Quantitative Risk Assessment	MW 5:00-6:50	4
180.640	Molecular Epidemiology and Biomarkers in Public Health	Tu Th 3:00-4:20	4
552.611	Globalization and Population Health	Online	0.5
552.608	Biologic, Genetic, and Infectious Bases of Human Disease	Online	0.5
552.609	Psychological and Behavioral Factors that Affect a Population's Health	Online	0.5

Fourth Term

Number	Course	Time	Credits
187.655	Evidence-Based Toxicology	Online	3
187.650	Alternative Methods in Animal Testing	Online	3
317.615	Topics in Risk Assessment	M 5:00-6:30	2
180.628	Intro. to Environmental & Occupational Health Law	Online	4
410.620	Program Planning for Health Behavior Change	Online	3
340.680	Environmental & Occupational Epidemiology	MW 1:30-3:20	4
182.845	MS Special Studies & Research	TBA	1

Year 2 - First Term

Number	Course	Credits
182.810	MS Field Placement	16

Second Term

Number	Course	Credits
182.810	MS Field Placement	14
182.850	MS Essay	2

9 MSE IN GEOGRAPHY AND ENVIRONMENTAL ENGINEERING

The MSE in Geography and Environmental Engineering comprises coursework which is normally completed in two semesters. MSE students have the option to complete an independent research project, submitted as a formal essay or a group project report. An MSE degree with significant research components will usually require three to four semesters for completion and is generally intended for those students planning to work in engineering practice. The MSE degree is open to students with an ABET-accredited undergraduate engineering degree or demonstrated equivalent. Students within this degree program can choose between five areas of study: Contaminant Fate and Transport, Environmental Process Engineering, Water Resources Engineering, Environmental Management and Economics, or Data Science and Analytics for Environmental Health and Engineering. Each individual's program of study is planned by the student in consultation with department faculty and must be approved by the faculty adviser.

9.1 POLICIES

9.1.1 Advisers

All new master's students will be assigned an adviser before their arrival. The adviser serves as the primary contact for the Department and will assist the student with course selection each term as well as interpretation of Departmental and School policies. Master's students in the Geography and Environmental Engineering program who choose to complete a research project as a part of their degree may choose a research adviser separate from their adviser.

9.1.2 Assessment of Progress

Each semester the student and their adviser will review grades from the previous term. Specific goals will be determined following this review. Students must meet minimum academic standards to remain in the master's program. A student who is experiencing academic difficulty will be notified in writing if they are expected to achieve a specific GPA during the upcoming term. Failure to meet any of the following criteria is grounds for dismissal from the program.

9.1.3 Grades in Core Courses

Students must earn a minimum grade on a set of required program-specific core courses: "Pass" for courses offered only on a pass/fail basis; "C" or higher for master's students for courses offered for letter grading. Students are permitted to apply up to two classes with a grade of "C" toward their degree. A student who earns a grade below that threshold in a course that meets a core requirement must, at the next opportunity, make a second attempt to complete the core course by repeating the same course or by completing another course that has been approved by the program director.

9.2 DEGREE PROGRAM REQUIREMENTS

Students must adhere to the following degree program requirements along with the course requirements for each area of study.

- A minimum of 30 credits including no more than 1 credit of seminar, 1 credit of intercession course work, 1.5 credits from the Center for Leadership Education (with adviser approval) and 6 credits of independent research counting toward the 30 credits
- At least 50 percent of the 30 credits must come from courses within the department
- Students are permitted to apply up to two classes with a grade of “C” toward their degree. No classes with “D” or “F” can be applied
- Five to six required courses and four to five recommended elective courses depending on track (note: in order to substitute an alternate course for a recommended elective, students must receive written approval from their adviser)
- Prerequisites (required) for the MSE program includes mathematics through differential equations and computing skills.
- AAP ([Advanced Academic Programs](#)) or EP ([Engineering for Professionals](#)) courses can be taken and counted to receive a master’s degree as long as there is sufficient rigor as deemed by the adviser. Students must have written consent from their adviser (an email will suffice) prior to signing up for the course.
- The Whiting School of Engineering strongly discourages master’s students from using 300-level courses to count towards the required number of master’s graduation credits. Exceptions to this rule should be reviewed on a case-by-case basis by the department. No more than two 300-level courses can be used to count towards the 30 master’s-level credits required for graduation. Advisers must provide an email to the academic program administrator to be kept in the student’s file. The email must indicate:
 - The 300-level course has been reviewed and deemed to have acceptable rigor, and
 - Where applicable, identifying the name and course number of the class that the 300-level course will replace

9.2.1 Concentration in Contaminant Fate and Transport

This concentration emphasizes understanding of physical, chemical and biological phenomena that affect the movement and transformation of pollutants in the environment.

Along with the degree program requirements, students are expected to adhere to the following course requirements. Substitutions for courses may be allowed with adviser approval. An approval email indicating the substitution must be sent to the academic program administrator.

9.2.1.1 Program Course Requirements

Core Courses:

- EN.575.645 Environmental Microbiology
- EN.570.615 Current Trends in Environmental Microbiology
- EN.570.641 Environmental Inorganic Chemistry
- EN.570.643 Aquatic and Biofluid Chemistry
- EN.570.652 Experimental Methods in Environmental Engineering Chemistry

Plus, one course in applied mathematics, numerical analysis, or engineering mathematics, such as:

- EN.570.695 Optimization Foundations for Environmental Engineering and Policy Design
- EN.570.697 Risk and Decision Analysis
- EN.560.601 Applied Math for Engineers

Students should select elective courses from the list of recommended electives appropriate for each track. Students may substitute an alternate course for a recommended elective and should seek approval from their faculty adviser before registering for the substituted course.

Recommended electives include:

- EN.570.619 Methods in Microbial Community Analysis
- EN.570.647 Hydrologic Transport in the Environment
- EN.570.651 Environmental Transport and Dispersion
- EN.570.657 Air Pollution
- AS.270.641 Present and Future Climate

9.2.2 Concentration in Environmental Process Engineering

This concentration involves the analysis and design of processes of water treatment, waste treatment and environmental remediation, and includes a solid grounding in the chemical, biological and physical principles underlying treatment and remediation technologies.

Along with the degree program requirements, students are expected to adhere to the following course requirements. Substitutions for courses may be allowed with adviser approval. An approval email indicating the substitution must be sent to the academic program administrator.

9.2.2.1 Program Course Requirements

Core Courses:

- EN.570.643 Aquatic and Biofluid Chemistry
- EN.570.644 Physical and Chemical Processes

- EN.570.648 Physical and Chemical Processes II
- EN.570.652 Experimental Methods in Environmental Engineering and Chemistry
- EN.575.645 Environmental Microbiology
- EN.575.706 Biological Processes for Water and Wastewater Treatment

One course in applied mathematics, numerical analysis or engineering mathematics, such as:

- EN.570.695 Environmental Health and Engineering Systems Design
- EN.570.697 Risk and Decision Analysis
- EN.570.616 Data Analytics in Environmental Health and Engineering

Additional requirements include an introductory fluid mechanics course. If this prereq is lacking, it can be taken as part of the course of study, but the credits will not be counted toward the 30-credit requirement.

Recommended electives include:

- EN.570.691 Hazardous Waste Engineering and Management
- At least one course in Geomorphology, Hydrology, or Ecology
- At least one course in Systems Analysis and Economics

9.2.3 Concentration in Water Resources Engineering

This concentration combines a solid grounding in environmental fluid mechanics and hydrology with electives in modeling, water development planning, policy and contaminant fate and transport.

Along with the degree program requirements, students are expected to adhere to the following course requirements. Substitutions for courses may be allowed with adviser approval. An approval email indicating the substitution must be sent to the academic program administrator.

9.2.3.1 Program Course Requirements

Core Courses:

- EN.570.653 Hydrology
- EN.570.651 Environmental Transport and Dispersion
- EN.570.412 Landscape Hydrology and Watershed Analysis

One course in applied mathematics, numerical analysis, or engineering mathematics, such as:

- EN.570.616 Data Analytics in Environmental Health and Engineering
- EN.570.695 Environmental Health and Engineering Systems Design

- EN.570.697 Risk and Decision Analysis

Additional requirements include an introductory fluid mechanics course. If this prereq is lacking, it can be taken as part of the course of study, but the credits will not be counted toward the 30-credit requirement.

Recommended electives include:

- At least one course in Systems Analysis and Economics
- EN.570.631 Collaborative Modeling for Resolving Water Resources Disputes
- EN.570.643 Aquatic and Biofluid Chemistry
- EN.570.644 Physical and Chemical Processes
- EN.570.654 Geostatistics: Understanding Spatial Data

9.2.4 Concentration in Environmental Management and Economics

This concentration, commonly referred to as “Systems” within the Department, focuses on using models of physical and economic systems to analyze and improve the design of public policies and environmental control systems.

Along with the degree program requirements, students are expected to adhere to the following course requirements. Substitutions for courses may be allowed with adviser approval. An approval email indicating the substitution must be sent to the academic program administrator.

9.2.4.1 Program Course Requirements

Core Courses:

- EN.570.616 Data Analytics in Environmental Health and Engineering
- EN.570.695 Environmental Health and Engineering Systems Design
- EN.570.697 Risk and Decision Analysis

Recommended electives include:

- At least one course in physical, chemical, or biological processes
- EN.570.618 Multiobjective Programming and Planning
- EN.570.631 Collaborative Modeling for Resolving Water Resources Disputes

9.2.5 Concentration in Data Science and Analytics for Environmental Health and Engineering

This concentration emphasizes innovative computational, statistical, and “big data” tools with applications to environmental problems in air pollution, energy systems, hydrology, and climate change.

Along with the degree program requirements, students are expected to adhere to the following course requirements. Substitutions for courses may be allowed with adviser approval. An approval email indicating the substitution must be sent to the academic program administrator.

9.2.5.1 Program Course Requirements

Core Courses:

Data Science Foundations (2 courses)

The following two courses are recommended:

- EN.570.616 Data Analytics in Environmental Health and Engineering
- EN.570.654 Geostatistics: Understanding Spatial Data

Students can also take the following courses to fulfill this requirement:

- EN.553.620 Introduction to Probability
- EN.553.626 Introduction to Stochastic Processes
- EN.553.630 Introduction to Statistics
- AS.270.654 Environmental Data Analysis
- AS.180.334 Econometrics

Environmental Foundations (3 courses)

Students interested in air pollution and climate should consider the following courses:

- EN.570.657 Air Pollution
- PH.182.615 Airborne Particles
- PH.180.607 Climate Change and Public Health
- AS.270.679 Atmospheric Science
- AS.270.641 Present and Future Climate
- AS.270.618 Remote Sensing of the Environment

Students interested in hydrology and water resources should consider the following courses:

- EN.570.351 Introduction to Fluid Mechanics
- EN.570.653 Hydrology
- EN.570.647 Hydrologic Transport in the Environment
- EN.570.651 Environmental Transport and Dispersion
- EN.570.643 Aquatic and Biofluid Chemistry

- AS.270.618 Remote Sensing of the Environment

Students interested in energy systems should consider the following courses:

- EN.570.607 Energy Policy and Planning Models
- EN.570.697 Risk and Decision Analysis

Students interested in health applications should consider the following course:

- PH.182.613 Exposure Assessment Techniques for Health Risk Management

Advanced Data Science (2 courses)

Students should take two additional courses in statistics, applied math, or computing. Graduate-level courses in the following departments will fulfill this requirement:

- EHE (only Geostatistics fulfills this requirement if not used to fulfill requirements in the Data Science Foundations category)
- Applied Math and Statistics (e.g., Data Mining, Bayesian Statistics, Seminar in Data Analysis, and other courses)
- Computer Science (e.g., Parallel Programming, Causal Inference, and other courses)
- Biostatistics
- Earth & Planetary Sciences (only Inversion Modeling & Data Assimilation or Geoscience Modeling fulfills this requirement)

Data Science Project (3 credits)

This requirement is waived if students are conducting master's thesis research for credit.