

UNIVERSITY OF MINNESOTA

Industrial Hygiene Program

STUDENT HANDBOOK

Masters (MS) and Doctoral (PhD) Degrees

2023-2024



UNIVERSITY OF MINNESOTA

School of Public Health

Follow the Industrial Hygiene Program on X (@UMN_IH)

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GENERAL DESCRIPTION

The University of Minnesota Industrial Hygiene (IH) Master of Science (MS) degree program, offered through the Graduate School, is meant for both practitioners and those contemplating careers in research or academic institutions. It can lead to further study toward a PhD degree. A full-time MS student can expect to complete the degree in two academic years, including course, applied practice experience, and Plan B project requirements. Students may take longer than this, depending on their circumstances. Students are expected to take a minimum of 42 semester credits of coursework (excluding the applied practice experience and Plan B project). With the Applied Practice Experience (PUBH 7196, 3 cr) and the Plan B Project (PUBH 7195, 3 cr), the total number of credits is a minimum of 48.

PhD students in the IH Program are expected to develop deep knowledge in the discipline and contribute to the peer-reviewed literature. The PhD program focuses on research, supplemented with advanced coursework, planned and carried out under the guidance of a faculty advisor and a doctoral committee. PhD students who do not have a Masters degree from an ABET accredited occupational or industrial hygiene program must complete the hygiene-specific courses required for the MS degree. Individual courses may be omitted in consultation with the advisor if comparable coursework can be demonstrated. Graduates are able to conduct independent research in industrial hygiene.

For more than 40 years, the IH Program has been funded in part by the National Institute for Occupational Safety and Health (NIOSH) through the Midwest Center for Occupational Health and Safety (MCOHS, see <http://www.mcohs.umn.edu/>), one of 18 Education and Research Centers (ERCs) nationwide. MCOHS provides financial assistance for qualified students who are U.S. citizens or permanent residents. The Industrial Hygiene MS degree program is accredited by the Applied and Natural Science Accreditation Commission of ABET (formerly the Accreditation Board for Engineering and Technology, see <http://www.abet.org>). A Masters degree from an ABET-accredited program will count for one year of work experience when applying to become a Certified Industrial Hygienist.

OCCUPATIONAL HYGIENE MAJOR

Through the 2023-2024 academic year, Industrial Hygiene MS and PhD students are enrolled in the Environmental Health major, in the Industrial Hygiene track. An Industrial Hygiene MPH track was also previously supported in the Environmental Health major. Starting in Fall 2024, incoming students will be admitted into a separate Occupational Hygiene major with MS and PhD degrees. Continuing IH students will have the option to stay in the Environmental Health major as part of the Industrial Hygiene track or to switch into the Occupational Hygiene major. From the standpoint of requirements for graduation, there will be little or no difference between the options. Collectively, faculty and staff will begin to refer to the program as the Occupational Hygiene program as the 2023-2024 academic year progresses.

MASTER OF SCIENCE CURRICULUM

The following courses are required of MS students entering the Industrial Hygiene Program during the 2023-2024 academic year. These courses will meet the requirements of the School of Public Health (SPH) and the IH Program.

School of Public Health Requirements (12 credits; these courses can be taken on-line during Fall, Spring & Summer semesters)

PUBH 6102	Issues in Environmental Health	2 cr
PUBH 6250	Foundations of Public Health	2 cr
PUBH 6320	Fundamentals of Epidemiology	3 cr
PUBH 6450	Biostatistics I	4 cr
PUBH 6742	Ethics in Public Health: Research and Policy	1 cr

Industrial Hygiene Required Courses (26 credits; some of these courses are only offered every other year as indicated)

PUBH 6104*	Environmental Health Effects: Introduction to Toxicology	2 cr (every other Fall, even years)
PUBH 6150*	Interdisciplinary Evaluation of Occupational Health & Safety Field Problems	3 cr
PUBH 6170*	Introduction to Occupational Health, Medicine, and Safety	2 cr
PUBH 6172	Industrial Hygiene Applications	2 cr (every other Spring, odd years)
PUBH 6173	Exposure to Physical Agents	2 cr (every other Fall, even years)
PUBH 6174	Control of Workplace Exposures	3 cr (every other Spring, odd years)
PUBH 6175	Environmental Measurements Laboratory	2 cr (every other Spring, even years)
PUBH 6192	Measurement and Properties of Air Contaminants	2 cr (every other Fall, odd years)
PUBH 6193	Advanced Topics in Human Exposure Science	2 cr (every other Fall, odd years)
PUBH 7195	MS in Environmental Health Sciences Plan B Project	3 cr
PUBH 7196*	Applied Practice Experience: Environmental Health	3 cr

* Course number and name may change

Industrial Hygiene Elective Courses (At least 10 credits are required; F = Fall Semester, S = Spring Semester):

PUBH 6020	Fundamentals of Social and Behavioral Science	2 cr (F&S)
PUBH 6107	Excel Skills for Data Management in Public Health Settings	1 cr (S)
PUBH 6112	Environmental Health Risk Assessment	2 cr (S)
PUBH 6120	Injury Prevention in the Workplace, Community, and Home	2 cr (S)
PUBH 6131	Working in Global Health	2 cr (S)
PUBH 6140	Occupational and Environmental Epidemiology	2 cr (S)
PUBH 6161	Regulatory Toxicology	2 cr (S)
PUBH 6162	Biomarkers	2 cr (F)
PUBH 6182	Emerging Infectious Disease	3 cr (S)
PUBH 6190	Environmental Chemistry	3 cr (F)
PUBH 6194	Climate Change and Public Health	2 cr (F)
PUBH 6232	Emergency Preparedness: A Public Health Perspective	2 cr (F)
PUBH 6451	Biostatistics II	4 cr (F&S)
PUBH 6751	Principles of Management in Health Services Organizations	2 cr (F&S)
CEGE 4561	Solids and Hazardous Wastes	3 cr (S)
CEGE 5551	Environmental Microbiology	3 cr (F)
CMGT 4031	Construction Safety and Loss Control	3 cr (F&S)
IE 5511	Human Factors and Work Analysis	4 cr (F)
KIN 5001	Foundations of Human Factors/Ergonomics	3 cr (F)
ME 5113	Aerosol/Particle Engineering	4 cr (F)
PA 5721	Energy Systems and Policy	3 cr (S)
Other courses approved by your academic advisor		

MINIMUM TOTAL CREDITS:

48 cr

The following table presents a sample two-year plan of study for the MS degree. This plan is an example; individual course plans may vary depending on the needs and interests of each student. Students should tailor their plan of study to their own needs in consultation with their academic advisors.

Fall	Spring	Summer
YEAR 1		
PUBH 6170 Introduction to Occupational Health, Medicine, and Safety (2 cr) PUBH 6450 Biostatistics I (4 cr) INDUSTRIAL HYGIENE ELECTIVES (1-3 cr) <u>Even years</u> PUBH 6104 Environmental Health Effects (2 cr) PUBH 6173 Exposure to Physical Agents (2 cr) <u>Odd years</u> PUBH 6192 Measurement and Properties of Air Contaminants (2 cr) PUBH 6193 Advanced Topics in Human Exposure Science (2 cr)	PUBH 6102 Issues in Environmental Health (2 cr) PUBH 6150 Interdisciplinary Evaluation of Occupational Health & Safety Field Problems (3 cr) <u>Odd years</u> PUBH 6172 Industrial Hygiene Applications (2 cr) PUBH 6174 Control of Workplace Exposures (3 cr) INDUSTRIAL HYGIENE ELECTIVES (1-3 cr) <u>Even years</u> PUBH 6175 Environmental Measurements Laboratory (2 cr) INDUSTRIAL HYGIENE ELECTIVES (4-6 cr)	PUBH 7196 Applied Practice Experience: Environmental Health (3 cr)
YEAR 2		
PUBH 6320 Fundamentals of Epidemiology (3 cr) PUBH 6742 Ethics in Public Health: Research and Policy (1 cr) INDUSTRIAL HYGIENE ELECTIVES (2-4 cr) <u>Odd years</u> PUBH 6192 Measurement and Properties of Air Contaminants (2 cr) PUBH 6193 Advanced Topics in Human Exposure Science (2 cr) <u>Even years</u> PUBH 6104 Environmental Health Effects (2 cr) PUBH 6173 Exposure to Physical Agents (2 cr)	PUBH 6250 Foundations of Public Health (2 cr) PUBH 7195 MS in Environmental Health Sciences Plan B Project (3 cr) <u>Even years</u> PUBH 6175 Environmental Measurements Laboratory (2 cr) INDUSTRIAL HYGIENE ELECTIVES (4-6 cr) <u>Odd years</u> PUBH 6172 Industrial Hygiene Applications (2 cr) PUBH 6174 Control of Workplace Exposures (3 cr) INDUSTRIAL HYGIENE ELECTIVES (1-3 cr)	

APPLIED PRACTICE EXPERIENCE

The Applied Practice Experience was formerly referred to as the Field Experience for MS students. This will likely become the case again by the start of the 2023-2024 academic year. The applied practice experience/field experience is a critical component of the MS degree in industrial hygiene. While the applied practice experience is most often pursued during the summer between the first and second year of the program, some students complete the requirement during the academic year. Students are required to complete 135 hours of industrial hygiene related tasks to meet requirements for the experience.

Many options are available for fulfilling the applied practice experience requirement, including full- or part-time employment and paid or unpaid internships. The applied practice experience should be arranged in consultation with your academic advisor. The required hours can be completed with more than one organization if necessary. If you have previous relevant work experience and wish to be considered for exemption from this requirement, you should first consult with your advisor. Generally, even those with previous experience are encouraged to consider doing additional field work, as another work experience in a different setting can broaden one's perspectives and skills.

Generally, announcements for applied practice experience opportunities are received by the faculty or Division and communicated directly to students. You are then expected to contact the organization directly. It is recommended that students begin searching for an appropriate applied practice experience during early spring semester of their first year. Faculty do not generally become personally involved in screening students or arranging internships. However, if you are seeking a particular type of experience, your advisor may be able to assist in identifying specific contacts or locations.

You must discuss your applied practice experience plans with your academic advisor to assure that it meets expectations for an experience relevant to industrial hygiene. In general, faculty expect that these experiences should offer some variety in activities (a mixture of office and on-site work) which fully encompass the industrial hygiene principles of anticipating, recognizing, evaluating, and controlling risks.

Applied practice experiences should not consist of singular, office-related activities, such as reviewing safety data sheets. An example of an appropriate applied practice experience is one which offers a student an opportunity to:

- observe and evaluate a variety of hazards
- participate in exposure assessment
- measure or design ventilation systems or other controls
- write reports in which they describe results and make recommendations
- participate in decision-making and other opportunities which help them understand the role of an industrial hygienist in the organization
- interact with a broad range of people, including workers, engineers, management, and health and safety professionals
- think creatively and apply their learning to specific problems and situations
- practice and learn new skills appropriate to the field

MS students are expected to complete on-line learning agreements for applied practice experiences and ensure that they are approved by the preceptor, academic advisor, and major coordinator before beginning the experience. An agreement can be initiated using the Field Experience module here: <https://www.sph.umn.edu/current/field-experience/field-experience-module/>. It is highly recommended that the student discuss these expectations and the plan for the applied practice experience with both the preceptor and the advisor prior to completion of the agreement.

If expectations are not met or the job description changes during the applied practice experience, this should be communicated to the advisor. A revised form may be necessary in some circumstances. Students who fail to complete this form within the first two weeks of beginning the applied practice experience may risk receiving a non-satisfactory grade in this course upon completion of the applied practice experience.

Upon finishing the 135 hours of the applied practice experience, students must complete an on-line report and evaluation about their experience and have the preceptor evaluate their participation. The academic advisor will then certify completion of the applied practice experience by completing the final section of the on-line form and submitting a grade (satisfactory/non-satisfactory). A student will receive an incomplete until the applied practice experience form has been completed.

Students may combine their applied practice experience and Plan B project. This requires careful consultation with your academic advisor (who oversees the applied practice experience), your Plan B project advisor (if different from the academic advisor), and your applied practice experience preceptor. It is strongly recommended that a meeting with all of the involved individuals be arranged during the early part of the applied practice experience, in which the specific project is discussed and arranged. The applied practice experience preceptor should receive copies of the expectations for Plan B projects from both the Division of Environmental Health Sciences Student Guidebook and the IH Program Student Handbook. Your advisors will help to ensure that the preceptor clearly understands these expectations and the nature of their written and oral presentation. An organization may have trade secret and confidentiality issues with the written publication or oral reporting of sampling or other data. The Plan B project advisor, with the student, should ensure that such issues are discussed and resolved prior to the start of the project work. The advisor or the preceptor may request a written agreement. If this is the case, it may be appropriate to ask the Division Head to review such an agreement.

See the section on Plan B Project section for more details. Keep in mind the requirements for human subjects approval. These requirements apply to the data from exposure sampling in which you are involved or that has been previously performed.

PLAN B PROJECT

General requirements and guidelines for the Plan B Project (PUBH 7195) for MS students are described in the Division of Environmental Health Sciences Student Guidebook and should be reviewed carefully. Specific requirements and expectations for Plan B projects in the IH Program are described below. During the 2023-2024 academic year, the IH Program faculty members expect to schedule one or more meetings each semester together with all industrial hygiene MS students to help them make steady progress on their projects.

Students pursuing an MS degree are required to produce a research paper, which results from a single, data-based research project. You should select a topic area with a Plan B project advisor who has relevant experience. Your Plan B project advisor may be your academic advisor, another faculty member in the IH program, another faculty member in Environmental Health, or a faculty member external to the Division (but with the appropriate affiliation status). Additional faculty may be consulted, if necessary, for advice and input regarding your project's design, implementation, and presentation. You should complete a Proposal Form once you have determined your topic. This should be submitted to your Plan B project advisor near the start of work on the project.

Students should submit a written paper to the Plan B project advisor as soon as possible after completion of the research project. The advisor is likely to return the paper for revisions; several drafts are typically required before the paper is considered acceptable. With the help of your project advisor, you should identify two additional faculty members to participate on your examination committee. These are typically people who have some expertise or interest in the thesis topic. Graduate School requirements for the MS degree indicate that two of the committee members should be from the student's major and one should be from a minor or related field. The latter requirement means that students must identify a faculty person in another Division or Department as the third member of their committee. All members must have an appointment in the Graduate School.

You should allow at least 1½ hours for your Plan B project examination. At the examination, you will make a short oral presentation (using projected slides), which should take no longer than 30 minutes. This oral presentation is open to the public. After the presentation and a public question-and-answer period, you will meet alone with the examining committee. Committee members are most likely to ask you questions about the specifics of your project, but they may also ask you questions about more general, but related, topics from your course of study.

You will be asked to contribute to an outreach product for your Plan B project. This product may take the form of a poster, a one-page handout, or something similar. MCOHS faculty and staff will assist you in this effort.

Plan B Paper Guidelines

Be sure to review the guidelines in the Division of Environmental Health Sciences Student Guidebook. In addition,

1. The project should address a theme relevant to the key principles of industrial hygiene: anticipating, recognizing, evaluating, and controlling risks.
2. The project may be carried out either in the laboratory or in a field setting (or a combination of these), or it may include development of theory or analyses of existing data.
3. The project must include analyses of data (statistically, or otherwise).
4. The paper should include a title page, abstract, the main body of the paper, acknowledgements, references, tables, figures, and appendices (if necessary). The main body of the paper should include the following sections: introduction, methods, results, discussion, and conclusions.
5. A review of original literature should be carried out and described in the introduction.
6. The paper should include a discussion of the limitations of the data and how these limitations might be eliminated in the future.
7. The paper should recommend future directions for research.

Human Subjects

The University of Minnesota Institutional Review Board (IRB) must approve all data-gathering for a research project that involves human subjects before it begins. If you use data gathered from human subjects previously (e.g., personal exposure sampling data), you must also obtain approval from this IRB before undertaking your project. See the Division of Environmental Health Sciences Student Guidebook for more details on human subjects requirements and approval.

Financial Support for Plan B Project Research

Student research can be supported financially in a variety of ways. If the project is performed at an external location, the work may be supported by that organization. If the project is associated with a research grant or contract, funding may be available for equipment and supplies. If students require a small amount of funding for equipment or supplies, they may request funds from the IH Program Director, in consultation with the project advisor. Many projects do not require support. Generally, salary support for performing project tasks should not be an expectation on the part of the student.

DOCTOR OF PHILOSOPHY CURRICULUM

Course requirements for the PhD degree depend on the student's prior academic training in occupational or industrial hygiene and the focus of the student's dissertation research. Students who do not have a Masters level degree from an ABET accredited occupational or industrial hygiene program must complete the industrial hygiene courses required for the MS degree at the University of Minnesota. All PhD students must complete 24 thesis/dissertation credits. Elective courses are selected to help the student become a more well-rounded researcher and to support the student's dissertation work. A minimum of 48 credits are required in total.

Core Requirements

3 credits

PUBH 6250* Foundations of Public Health (2 cr)

PUBH 6742 Ethics in Public Health: Research & Policy (1 cr)

**Required for students who do not have an MPH, a bachelor's degree in Public Health or a Minor in Public Health.*

Thesis Credits

24 credits

PUBH 8888 Thesis Credits (24 cr)

Industrial Hygiene Requirements

20 credits

These courses are only required for students who do not have a master's degree from an ABET accredited industrial hygiene program. Individual courses may be omitted in consultation with the advisor if comparable graduate level coursework can be demonstrated.

PUBH 6104 Environmental Health Effects: Introduction to Toxicology (2 cr)

PUBH 6150 Interdisciplinary Evaluation of Occupational Health & Safety Field Problems (3 cr)

PUBH 6170 Introduction to Occupational Health, Medicine, & Safety (2 cr)

PUBH 6172 Industrial Hygiene Applications (2 cr)

PUBH 6173 Exposure to Physical Agents (2 cr)

PUBH 6174 Control of Workplace Exposure (3 cr)

PUBH 6175 Environmental Measurements Laboratory (2 cr)

PUBH 6192 Measurement & Properties of Air Contaminants (2 cr)

PUBH 6193 Advanced Topics in Human Exposure Science (2 cr)

Electives

Electives are determined in consultation with the advisor and committee, and may include the following:

PUBH 6107 Excel Skills for Data Management in Public Health Settings (1 cr)

PUBH 6141 GIS and Spatial Analysis for Public Health (3 cr)

PUBH 6161 Regulatory Toxicology (2 cr)

PUBH 6162 Biomarkers (2 cr)

PUBH 6450 Biostatistics I (4 cr)

PUBH 6451 Biostatistics II (4 cr)

PUBH 7430 Statistical Methods for Correlated Data (3 cr)

PUBH 7440 Introduction to Bayesian Data Analysis (3 cr)

PUBH 8120 Occupational Health & Safety Research Seminar (1 cr)

ME 5113 Aerosol/Particle Engineering (4 cr)

DOCTORAL DEGREE REQUIREMENTS

In addition to the course requirements, the following are also requirements for the doctoral degree.

Preliminary Written Exam

The preliminary written exam for PhD student in the Industrial Hygiene Program shall consist of both a take-home exam and a research project proposal. The guidelines for the research project proposal can be found in the Division of Environmental Health Sciences Student Guidebook.

The take-home portion of the preliminary written exam will consist of questions prepared by the IH Program faculty, including the dissertation advisor. The faculty member who prepared the question will be responsible for reviewing that question and determining whether the response warrants a pass or fail. The IH Program faculty will meet to discuss the exam as a whole and reach a final determination. If the student does not receive a pass on the exam as a whole, the student may re-take the exam one additional time. The faculty will, as a group, determine the content of the second exam, which may involve response revisions or preparation of responses to new questions.

The student will be expected to complete the take-home exam in a two-week period and must be completed entirely by the individual. Written resources, including books, journal articles, and web-based materials may be used as references. The student may not discuss the exam with others or seek assistance from anyone.

The take-home examination will address the three primary topic areas of industrial hygiene: recognition, evaluation, and control. The student will be expected to demonstrate proficiency in each of these areas by preparing a response that may include both qualitative and quantitative features. The following resources are recommended for each of these areas. If a student does not already possess the resources, they may be available from faculty or through the University of Minnesota Libraries.

Recognition

Students should understand the steps necessary for identifying and prioritizing workplace hazards.

- OSHA and NIOSH standards and guidelines (www.osha.gov and www.cdc.gov/niosh)
- ACGIH TLV and BEI book
- ACGIH TLV documentations
- A Strategy for Assessing and Managing Exposures, AIHA (latest edition)
- The Occupational Environment: Its Evaluation and Control and Management, S. Dinardi, AIHA (latest edition)
- Occupational and Environmental Health: Recognizing and Preventing Disease and Injury, B.S. Levy, DH Wegman (latest edition)

Evaluation

Students should understand the interpretation of lognormal data, sampling strategies, types of sampling instruments, decision making based on exposure modeling and data interpretation, and properties of airborne contaminants.

- Occupational Exposure Assessment for Air Contaminants, G. Ramachandran
- Aerosol Technology, W. Hinds
- NIOSH Manual of Analytical Methods (www.cdc.gov/niosh)
- Mathematical Models for Estimating Occupational Exposure to Chemicals, AIHA (latest edition)

Control

Students should understand and be able to apply the hierarchy of controls. They should be able to demonstrate proficiency in selecting solutions ranging from engineering controls (e.g. ventilation) to personal protective equipment (e.g. gloves, respirators, etc.).

- Industrial Ventilation, ACGIH (latest edition)
- NIOSH Respirator Selection Logic
- NIOSH Pocket Guide
- The Occupational Environment: Its Evaluation and Control and Management, S. Dinardi, AIHA (latest edition)
- Other personal protection selection guidelines and tools

Preliminary Oral Exam

Students take a preliminary oral examination after completing a substantial portion of their coursework and passing the preliminary written exam. This exam is administered by a committee consisting of at least four members: three from the major field and one from a minor field or supporting program. A student presents their research ideas in a closed session, and committee members will ask the student detailed questions about their proposed research, including questions that may draw on previous coursework. The doctoral preliminary oral examination is graded either pass, pass with reservations, or fail. A pass with reservations may require some revisions to research ideas before the committee will agree to a passing grade. If a student fails the exam, they may retake the examination once, if the committee members approve this option.

Final Oral Exam

After completion of the research, the PhD student will write a dissertation, submit it for review and approval by their doctoral committee, and, with the committee's approval, proceed to the final oral examination. This examination will consist of a public seminar of the research, usually lasting an hour, including questions from the audience, followed by a closed examination with the committee members. The final oral examination is graded as either pass or fail.

FACULTY INFORMATION

The faculty of the Industrial Hygiene Program includes:

Dr. Peter Raynor, PhD, FAIHA

Professor

Director of Graduate Studies, Occupational Hygiene Program

Office: 1242 Mayo

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Dr. Susan Arnold, PhD, CIH, FAIHA

Associate Professor

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Dr. Tran Huynh, PhD, CIH

Associate Professor

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Phone: (612) 624-3143

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The research interests and other activities of each faculty member are described in detail on the School of Public Health web site (<https://directory.sph.umn.edu/>) and the Midwest Center for Occupational Health and Safety web site (<http://mcohs.umn.edu/faculty-and-staff/>).

Advisor Roles and Responsibilities

When you enter the IH Program, you will be assigned an academic advisor from among the Program's faculty. This advisor is responsible for working with advisees to ensure that they progress through the Program in a timely manner, fulfilling the School, Division, and Program requirements. You should arrange to meet with your advisor at least once each semester to discuss your plans and progress.

You are responsible for selecting your MS Plan B project or MPH integrative learning experience advisor. Your academic advisor may serve as your Plan B project/integrative learning experience advisor, or you may select a separate advisor for your Plan B project/integrative learning experience. This will depend on the nature of your research project or literature review. In general, your Plan B project/integrative learning experience advisor should be selected from among the IH Program faculty, although exceptions to this are possible.

Your Plan B project/integrative learning experience advisor is generally selected before the end of the first full year. This person is responsible for working closely with you on your project, ensuring that you are moving toward completion in a timely manner. Meetings with your Plan B project/integrative learning experience advisor may occur frequently as you pursue your project.

COURSE EXEMPTION POLICY

School of Public Health required courses carry individual policies concerning exemption. Consult the Division of Environmental Health Sciences Student Guidebook or the lead instructors for information about these policies.

Exemptions from course requirements in the Industrial Hygiene Program may be granted by the lead instructor for a course. The only exception to this is for the Applied Practice Experience; an exemption to this must be approved by the academic advisor and the IH Program Director.

Generally, the student is asked to provide documentation in the form of a transcript, course description, and course outline to demonstrate that the coursework has already been covered elsewhere. It is entirely up to the lead instructor to determine the applicability of other coursework. The lead instructor may also require students to take an exemption-qualifying exam. If the exemption is granted, the student's documentation and a letter from the instructor are placed in the student's record.

FINANCIAL SUPPORT

The IH Program has received funding to support Masters and doctoral students from the National Institute for Occupational Safety and Health (NIOSH), as part of the Midwest Center for Occupational Health and Safety (MCOHS), a NIOSH-funded Education and Research Center. These funds are dependent on a number of factors, including U.S. Congressional support of NIOSH, NIOSH support of individual programs, and the individual program's success in meeting NIOSH expectations. The NIOSH funds are available to U.S. citizens or permanent residents only.

The IH Program has been able to provide support in the form of tuition, fees, and health insurance (if needed) to most incoming MS students who are U.S. citizens or permanent residents. It is the program's expectation that this funding will continue, dependent on those issues described above. Generally, we have been able to award full tuition support to both first- and second-year MS students. These awards do not carry expectations with respect to an awardee's activities, other than to attend classes and maintain acceptable progress toward a degree.

MCOHS-funded MS trainees are eligible to receive support for travel and related expenses to attend the American Industrial Hygiene Association (AIHA) Connect conference on one occasion while they pursue their degree. This support is contingent on availability of funds, as tuition support needs have first priority. The expectations for students wishing to receive support for attendance to the AIHA Connect are as follows:

- a. You must submit an abstract to present a poster in the student poster session. The deadline for abstract submission is usually in January or February. Check the AIHA Connect website for more information.
- b. You must attend at least two full technical sessions (technical paper presentations or roundtables) while at the conference.

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- c. You must attend and help out at the University of Minnesota IH Program Alumni and Friends Reception at the conference.

Funding for PhD students is frequently available in the form of MCOHS traineeships for students who are U.S. citizens or permanent residents. Traineeships may provide tuition and fee coverage, full or partial stipends, health insurance if needed, and support for travel to one or more academic conference per year.

Other Sources of Financial Support

- Teaching Assistant and Research Assistant positions may be available with faculty in the Division of Environmental Health Sciences. These provide excellent opportunities to gain experience in teaching and research; they also serve as a means of reducing tuition costs (a 25% RA position, for example, will reduce tuition costs by 50%; a 50% position reduces tuition to nothing).
- The American Industrial Hygiene Foundation (AIHF) offers scholarships to industrial hygiene students. University of Minnesota IH Program students have been awarded these scholarships many times, typically winning at least one scholarship annually. Scholarships are awarded based on the availability of funds provided through contributions from AIHA members, individuals, corporations, and local sections. Students do not apply for a specific scholarship. Students who complete an application will be considered for all the scholarships for which they are eligible. The AIHF Scholarship Selection Committee will determine the scholarship awards during the selection process. Scholarship applications are typically accepted in January each year. Visit <https://www.aiha.org/get-involved/aih-foundation/aih-foundation-scholarships> for more information.
- 3M's Personal Safety Division (PSD) annually sponsors an Occupational Health and Safety Scholarship Program. This program signifies PSD's support of quality education and training in the occupational health and safety/industrial hygiene profession. The program is designed to help recognize the contributions and importance of proper safety and health practices and training in the workplace. Three scholarships, in the amount of \$5,000 each, are awarded by 3M to selected students pursuing graduate-level education in occupational health or safety/industrial hygiene in the U.S. or Canada. In addition to the scholarships, 3M provides each awardee with airfare, accommodations for up to four nights, and a \$50 per diem to attend the AIHA Connect conference. University of Minnesota IH Program students have been awarded this scholarship on multiple occasions. Applications are typically accepted in February or March of each year.
- The Northwest Chapter of the American Society of Safety Professionals (ASSP) awards scholarships totaling \$4,000 available for students pursuing a graduate degree at a several Minnesota and Wisconsin institutions including those studying an occupational safety, health, or environmental program such as the IH Program at the University of Minnesota. Applications are typically due in March of each year. Visit <https://northwest.assp.org/student-scholarships/> for more details.

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- Pilot Project Research Training Program grants of up to \$20,000 are available to doctoral students through the Midwest Center for Occupational Health and Safety. This is a competitive grant application process, with priority given to research proposals with a high potential for affecting the practice of occupational health and safety, research ideas that have the potential for resulting in peer-reviewed publications and being developed into proposals for more substantial funding, and doctoral students undertaking research required for their degree. Research must be relevant to the occupational health and safety field and focus on the National Occupational Research Agenda objectives. Requests for proposals for these pilot grants are announced each fall on the Midwest Center for Occupational Health and Safety web site (<http://www.mcohs.umn.edu/pilot-projects/>)

MENTOR PROGRAM

The School of Public Health Mentor Program connects public health students to public health professionals to help with career and professional development. Students are strongly encouraged to participate in this valuable program. For mentees, the program can have a key impact on future career choices. The School boasts the largest mentor program of any school of public health, serving about 400 students and mentors with special events and helpful resources. Many industrial hygiene students have benefitted greatly from this formal mentoring program, establishing long-lasting friendships with their mentors, who ideally will be practicing industrial hygienists. For more information, see <http://www.sph.umn.edu/current/mentor/>. Applications are generally due in early- to mid-September.

PROFESSIONAL ORGANIZATIONS

American Industrial Hygiene Association

The American Industrial Hygiene Association (AIHA, <http://www.aiha.org>) is a national organization for professionals working in the field of industrial hygiene or related fields. With approximately 10,000 members, this organization is based in Washington, DC and carries out considerable lobbying and volunteer-based activities (through committees and other groups). Many states have one or more local sections of the AIHA, which are affiliated with the national association. In addition, students at many universities, including the University of Minnesota, have established student AIHA chapters. Membership in the national organization is separate from membership in the local or student sections. The AIHA organizes and sponsors the AIHA Connect conference each year during May or June. Together with the American Conference of Governmental Industrial Hygienists, the organization publishes the *Journal of Occupational and Environmental Hygiene*.

The Upper Midwest Section of the AIHA has members from Minnesota, Wisconsin, North Dakota, and South Dakota. This section has regular meetings during the year (September to June), usually at lunchtime on the third Thursdays of the month. The membership fee is waived for students, and the section will subsidize half the cost of meetings for students (luncheon meetings are usually about \$20). It is highly recommended that you join this group and participate in their meetings. This is an excellent way to meet practicing industrial hygienists,

many of whom are familiar with internships and other opportunities in the Twin Cities. An additional perk is a regular annual membership directory.

American Conference of Governmental Industrial Hygienists

The American Conference of Governmental Industrial Hygienists (ACGIH, <http://www.acgih.org/>) is a second important professional organization comprised of industrial hygienists in research, academia, and government organizations. Industrial hygienists who work for businesses may be affiliate members, but do not have voting privileges. As a student, you are eligible for a student membership with this organization.

The ACGIH has a number of technical committees, the foremost of which address Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), Ventilation, Air Sampling Instruments, and Air Sampling Procedures. Together with the AIHA, the organization publishes the *Journal of Occupational and Environmental Hygiene*.

ACGIH offers full-time students in occupational and environmental health and safety with complimentary student subscriptions or discounts to key publications. These include free access to the ACGIH Data Hub with TLVs and BEIs and nearly 800 TLV and BEI Supporting Scientific Documentations, a complimentary annual Digital TLVs and BEIs Book, complimentary online monthly issues of the *Journal of Occupational and Environmental Hygiene*, and discounts on a range of scientific publications. Students can visit [this link](#) to sign up.

Board for Global EHS Credentialing

In 2019, the American Board of Industrial Hygiene (ABIH) changed its name to the Board for Global EHS Credentialing (BGC, <https://gobgc.org/>). BGC is the world's largest certifying organization for the industrial hygiene profession. BGC administers the Certified Industrial Hygienist (CIH) credential. Certification is an important step for most industrial hygienists. You are encouraged to review the educational, work, and other requirements for obtaining and maintaining certification.

Alliance of Hazardous Materials Professionals

The Alliance of Hazardous Materials Professionals (AHMP, <https://www.ahmpnet.org/>) is a professional association with a membership of more than 3,000 of the nation's leading experts in environmental, health, safety and security management. AHMP is the only national organization devoted to the professional advancement of the hazardous materials management field. Members are distributed across 52 chapters in 37 states plus the District of Columbia. AHMP's core purpose is to foster a community of professionals and to jointly advocate for the public recognition of the value of the Certified Hazardous Material Manager (CHMM) credential and other EHS&S credentials, the standards they represent, and the professionals who uphold them.

Institute of Hazardous Materials Management

The Institute of Hazardous Materials Management (IHMM, <http://www.ihmm.org/>) manages the Certified Hazardous Materials Manager (CHMM) program, a certification in hazardous materials management based on work experience, education and a written test. This certification may be

important for those industrial hygienists seeking professional work in the area of hazardous substances.

American Society of Safety Professionals

The American Society of Safety Professionals (ASSP, <https://www.assp.org/>) is a professional organization with 36,000 members worldwide. The organization publishes the Professional Safety Journal, standards, and technical resources and runs an annual conference. A membership application can be downloaded from the web site. Student memberships are a special price. Many occupational hygienists who are ASSP members become Certified Safety Professionals (CSPs), an accreditation that is managed by the Board of Certified Safety Professionals (<https://www.bcsp.org/>).

Minnesota Safety Council

The Minnesota Safety Council (MSC, <https://www.minnesotasafetycouncil.org/>) is a member-based, private, not-for-profit organization dedicated to preventing unintentional injuries. MSC has established a young professionals group, with student memberships free and memberships for young professionals at a significantly reduced cost.

Product Stewardship Society

The Product Stewardship Society (PSS, <http://www.productstewards.org/>) is a professional organization affiliated with the AIHA. Its mission is to enable professionals involved in the practice of product stewardship to promote responsible design, development, and management of products throughout their life cycle. The Product Stewardship Society now offers a certification with the designation Certified Profession Product Steward (CPPS).

PROFESSIONAL CERTIFICATION

Becoming a Certified Industrial Hygienist (CIH) is an important goal for many people in this profession. While the University of Minnesota IH Program is not specifically designed to either address or assure certification, the preparation received should be more than adequate for the certification examination. Students are strongly encouraged to read a description of the CIH process, found on the BGC web site (<https://gobgc.org/cih/>). It should be noted that a Masters degree from a program with ABET accreditation, such as the University of Minnesota, will count as one year of work experience.

INDUSTRIAL HYGIENE CODE OF ETHICS

The AIHA and ACGIH are nonprofit voluntary professional membership associations dedicated to the advancement of the field of industrial hygiene, and the protection of health and safety. Therefore, we support quality professional standards and practices, and expect our respective members to meet such standards.

In support of these important purposes, we promote ethical professional practices and strongly encourage members to understand ethical responsibilities. As a matter of professional competence and public confidence, members are expected to conduct themselves consistent with applicable ethics standards, including those of the American Board of Industrial Hygiene (ABIH).

Accordingly, we have adopted the following member ethical principles in order to guide the members, support the profession, and protect health and safety.

I. Responsibilities to the Professional Organizations, the Profession and the Public.

- A. In order to satisfy organizational and legal policies and rules, members should:
 - 1. Comply with laws, regulations, policies, and ethical standards governing professional practice of industrial hygiene and related activities, including those of professional associations and credentialing organizations.
 - 2. Provide accurate and truthful information to professional associations and credentialing organizations.
 - 3. Cooperate with professional associations and credentialing organizations concerning ethics matters and the collection of information related to an ethics matter.
 - 4. Report apparent violations of applicable professional organizations' ethical standards to appropriate organizations and agencies upon a reasonable and clear factual basis.
 - 5. Refrain from any public behavior that is clearly in violation of accepted professional, ethical or legal standards.
 - 6. Promote equal opportunity and diversity in professional activities.
 - 7. Support and disseminate the association's ethics principles to other professionals.

II. Responsibilities to Clients, Employers, Employees and the Public.

- A. In order to provide ethical professional services, members should:
 - 1. Deliver competent services in a timely manner, and with objective and independent professional judgment in decision-making.
 - 2. Recognize the limitations of one's professional ability, and provide services only when qualified. The member is responsible for determining the limits of his/her own professional abilities based on education, knowledge, skills, practice experience, and other relevant considerations.
 - 3. Provide appropriate professional referrals when unable to provide competent professional assistance.
 - 4. Maintain and respect the confidentiality of sensitive information obtained in the course of professional or related activities unless: the information pertains to an illegal activity; a court or governmental agency lawfully directs the release of the information; the client/employer expressly authorizes the release of specific

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- information; or, the failure to release such information would likely result in death or serious physical harm to employees and/or the public.
5. Properly use professional credentials and provide truthful and accurate representations concerning education, experience, competency and the performance of services.
 6. Provide truthful and accurate representations to the public in advertising, public statements/ representations, and in the preparation of estimates concerning costs, services, and expected results.
 7. Recognize and respect the intellectual property rights of others, and act in an accurate, truthful, and complete manner, including activities related to professional work and research.
 8. Affix or authorize the use of one's seal, stamp or signature only when the document is prepared by the certificant/candidate or someone under his/her direction and control.
 9. Refrain from business activities and practices that unlawfully restrict competition.
- B. In order to satisfy organizational policies and legal requirements concerning possible conflicts of interest and similar issues, members should:
1. Disclose to clients or employers significant circumstances that could be construed as a conflict of interest, or an appearance of impropriety.
 2. Avoid conduct that could cause a conflict of interest with a client, employer, employee, or the public.
 3. Assure that a conflict of interest does not compromise legitimate interests of a client, employer, employee, or the public and does not influence/interfere with professional judgments.
 4. Refrain from offering, or accepting inappropriate payments, gifts, or other forms of compensation or benefits in order to secure work, or that are intended to influence professional judgment.
- C. In order to satisfy organizational policies and legal requirements concerning public health and safety, members should:
1. Follow appropriate health and safety procedures in the course of performing professional work to protect clients, employers, employees, and the public from conditions where injury and damage are reasonably foreseeable.
 2. Inform appropriate management representatives and/or governmental bodies of violations of legal and regulatory requirements when obligated or otherwise clearly appropriate.
 3. Make reasonable efforts to ensure that the results of industrial hygiene assessments are communicated to exposed populations.

AIHA CONNECT STUDENT POSTERS AND ABSTRACTS

As described above, if students wish to receive support for travel to the AIHA Connect conference, held each year in May or June, they must submit an abstract for delivering a poster presentation at the student poster session or an oral presentation. The abstract deadline for the poster session is usually in January or February; the IH Program faculty will inform you of the exact date when it is known. Abstracts are submitted on-line through the conference web site.

What to present? Usually, posters involve work performed on Plan B projects for MS students or dissertation research for PhD students, although other options, such as work performed during applied practice experiences, are possible. Faculty in the IH Program can assist you in identifying poster topics.

The abstract must follow the guidelines outlined in the abstract form, with some additions:

- a. The name of your faculty advisor must be included in the submission.
- b. Your primary affiliation should be with the University of Minnesota. If you performed this work elsewhere (e.g. a company) you must be sure to obtain permission from the company before submitting the abstract. Your affiliation with this company may be indicated in the body of the abstract, if necessary.

It is a requirement that you ask your academic, Plan B project, or doctoral dissertation advisor to review your abstract, as you are representing the University of Minnesota and because the IH Program faculty members are familiar with the criteria and expectations for abstracts.

After your abstract is accepted, you will work on your poster in consultation with your faculty advisor and any other co-authors. The posters should use University of Minnesota School of Public Health branding, which your advisor can provide to you.

ACCREDITATION

The Accreditation Board for Engineering and Technology (<http://www.abet.org>) serves as the accrediting organization for masters-level industrial hygiene programs. The Industrial Hygiene Program MS and MPH degrees are accredited by the Applied and Natural Science Accreditation Commission of ABET. The accreditation is granted in six-year blocks. One of the requirements of accreditation is that your degree or transcript reflects your program. Thus, when you complete this Program, your major will be listed as "Environmental Health – Industrial Hygiene Track" or "Occupational Hygiene" on your transcript.

EDUCATIONAL OBJECTIVES

Industrial hygienists are expected to apply and communicate knowledge of hazards and risks, with cultural competence and by putting guidelines, regulations, and policies into practice, to reduce unsafe exposures and promote healthy working conditions. Accordingly, the educational objectives of the Industrial Hygiene Masters Program are to produce graduates who, within three years of graduation, are able to:

- a. Demonstrate a high level of technical and scientific competence in anticipating, recognizing, evaluating, and controlling occupational and environmental risks.
- b. Solve complex problems through a combination of observation, communication, literature review, measurement, modeling, and data analysis.
- c. Communicate effectively with a wide range of constituents using spoken, written, and visual methods across multiple platforms with sensitivity toward diversity, equity, and inclusion.
- d. Design and develop long-range goals and programs.
- e. Act and behave responsibly and ethically according to professional standards and codes of conduct.
- f. Interact competently and professionally at all levels of an organization, working as a fully contributing member of a team and conducting independent work responsibilities confidently.
- g. Seek work experience and on-going education for their professional advancement leading to professional certification.
- h. Use their knowledge and skills to benefit the community in recognizing work and environmental risks and educating those responsible for managing these risks.

PROGRAM OUTCOMES

In the broadest sense, the Industrial Hygiene Master's Program prepares students for professional practice, which means they will work toward the solution of a broad range of problems in a variety of settings. More specifically, this program is designed to develop knowledge and skills in the six key areas of Recognition, Evaluation, Control, Communication, Behavior and Management. For each of these key areas we expect students upon graduation to be able to:

Recognition

- R1. Anticipate and recognize occupational and environmental hazards (i.e., physical, chemical, and biological agents, factors, and stressors) generated by or associated with defined sources, unit operations, and/or work-related processes
- R2. Demonstrate an understanding of the relationship between exposures and health outcomes
- R3. Describe, interpret, and apply occupational and environmental regulations and guidelines
- R4. Include cultural and social factors in hazard recognition activities including training and hazard communication

Evaluation

- E1. Apply scientific principles to design methods for gathering and managing data, including using instrumentation and other methods to assess exposures to hazards and evaluate risks
- E2. Measure and evaluate health and safety programs

Control

- Con1. Design and implement work process interventions
- Con2. Recommend, evaluate and implement engineering, administrative, and personal protective controls and/or other interventions to reduce or eliminate hazards
- Con3. Validate the effectiveness of selected hazard control methods

Communication

- Com1. Communicate effectively and appropriately in both written, graphic, and oral media to advocate for continuous improvement in worker health and safety to pertinent audiences, including workforce, management, the public, and professional peers
- Com2. Design and deliver adult education programs
- Com3. Communicate effectively with other safety and health professionals

Behavior

- B1. Demonstrate awareness of diversity, equity and inclusion and the ability to work constructively in a diverse workforce and society
- B2. Practice professional duties in alignment with the professional codes of ethics
- B3. Explain and apply laws, regulations, and guidelines
- B4. Function effectively on an interdisciplinary team, contributing to an inclusive space for engaging in respectful conversation, debate, and collaboration
- B5. Engage in professional development activities

Management

- M1. Formulate and implement guidelines and policies
- M2. Manage resources efficiently and effectively to ensure they promote safe and healthy work and workplaces
- M3. Develop and implement health and safety programs to reduce workplace injuries, illnesses, and health disparities
- M4. Demonstrate the importance of business acumen for improving financial performance and leadership development

ASSESSING PROGRAM OUTCOMES

You are the most important source of information about the effectiveness of this educational program. Therefore, we will ask you periodically for feedback on how well we have accomplished our program outcomes. At the end of each academic year, we will try to schedule a student/faculty get-together during which we gather your input about the IH Program as a whole, your courses, your interactions with the professional community, and other topics. Your input is very important to us. Please feel free to share your comments with us throughout the time you are here.

As a graduate of the IH Program, we may contact you periodically for your input on how well the Program prepared you for your work. Please follow the IH Program on X (@UMN_IH) and individual faculty members on LinkedIn, and keep us informed of your latest work address and email so we can keep our list current. We will invite you to the annual alumni and friends reception at AIHA Connect. Plus...we really enjoy hearing about what you are doing!