

UNIVERSITY OF MINNESOTA

Industrial Hygiene Program

STUDENT HANDBOOK

Masters (MS and MPH) and Doctoral (PhD) Degrees

2017-2018



UNIVERSITY OF MINNESOTA

School of Public Health

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TABLE OF CONTENTS

GENERAL DESCRIPTION	3
MASTERS PROGRAM CURRICULUM.....	3
EXAMPLE INDUSTRIAL HYGIENE STUDENT COURSE PLAN	5
FIELD EXPERIENCE.....	6
CULMINATING EXPERIENCE.....	8
FACULTY INFORMATION	10
COURSE EXEMPTION POLICY	11
FINANCIAL SUPPORT	11
MENTOR PROGRAM.....	13
PROFESSIONAL ORGANIZATIONS	13
PROFESSIONAL CERTIFICATION	15
INDUSTRIAL HYGIENE CODE OF ETHICS.....	15
AIHCE STUDENT POSTERS AND ABSTRACTS	16
ACCREDITATION	16
EDUCATIONAL OBJECTIVES	17
PROGRAM OUTCOMES.....	17
ASSESSING PROGRAM OUTCOMES	19
DOCTORAL DEGREE REQUIREMENTS	20

GENERAL DESCRIPTION

Students in the University of Minnesota Industrial Hygiene (IH) Masters-level programs may be enrolled in either the Master of Science (MS) or Master of Public Health (MPH) degree in Environmental Health. The MS, 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. The MPH, offered through the School of Public Health, is often thought to be a terminal degree for practitioners, although it is certainly possible to proceed to a PhD degree program after completing an MPH.

At the present time, there are few curricular differences between the two degrees as offered in the Industrial Hygiene Program. Coursework, field experience, culminating experience, and other requirements are almost the same for the MS and MPH degrees. The specific differences between the MS and MPH degree options are as follows:

- Students taking the MS degree must register for PubH 6742 Ethics in Public Health: Research and Policy, while those in the MPH degree must register for PubH 6741 Ethics in Public Health: Professional Practice and Policy.
- Students pursuing the MS degree must prepare a Research Paper for their Culminating Experience (PubH 7194). Students pursuing an MPH degree may prepare either a Research Paper or a Literature Review for their Culminating Experience.

For nearly 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 applicants who are U.S., citizens or permanent residents. The Industrial Hygiene Masters (MS and MPH) programs are accredited by the Applied Science Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET, 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.

A full-time student in the MS or MPH degree programs can expect to complete the degree in two academic years, including course, field experience, and culminating experience requirements. Students may take longer than this, depending on their circumstances. Students are expected to take a minimum of 46 semester credits of coursework (excluding the field experience and culminating experience). With the Field Experience (PubH 7196, 3 cr) and the Culminating Experience (PubH 7194, 3 cr), the total number of credits is a minimum of 52.

MASTERS PROGRAM CURRICULUM

The following courses are required of MS and MPH students entering the Industrial Hygiene Program during the 2017-2017 academic year. These courses will meet the requirements of the School of Public Health (SPH), Division of Environmental Health Sciences (EnHS), and IH Program.

COURSE REQUIREMENTS

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

PubH 6020	Fundamentals of Social and Behavioral Science	3 cr	
PubH 6102	Issues in Environmental Health	2 cr	
PubH 6320	Fundamentals of Epidemiology	3 cr	
PubH 6450	Biostatistics I	4 cr	
PubH 6741	Ethics in Public Health: Professional Practice and Policy	1 cr	[MPH]
PubH 6742	Ethics in Public Health: Research and Policy	1 cr	[MS]
PubH 6751	Principles of Management in Health Services Organizations	2 cr	

Division of Environmental Health Sciences Requirements:

PubH 61??	(New Division of Environmental Health Sciences Core Course)	4 cr	
PubH 7194	Culminating Experience: Environmental Health (Research Paper or Literature Review)	3 cr	[MPH]
PubH 7194	Culminating Experience: Environmental Health (Research Paper)	3 cr	[MS]
PubH 7196	Field Experience: Environmental Health	3 cr	

Occupational Health and Safety Requirements:

PubH 6130	Occupational Medicine: Principles and Practice	2 cr	
PubH 6150	Interdisciplinary Evaluation of Occupational Health & Safety Field Problems	3 cr	
PubH 6170	Introduction to Occupational Health and Safety	3 cr	

Industrial Hygiene Program Requirements (These courses are only offered every other year)

PubH 6172	Industrial Hygiene Applications	2 cr	
PubH 6173	Exposure to Physical Agents	2 cr	
PubH 6174	Control of Workplace Exposures	3 cr	
PubH 6175	Environmental Measurements Laboratory	2 cr	
PubH 6192	Measurement and Properties of Air Contaminants	2 cr	
PubH 6193	Advanced Topics in Human Exposure Science	2 cr	

Industrial Hygiene Electives (At least 6 credits are required; F = Fall Semester, S = Spring Semester):

PubH 6112	Environmental Health Risk Assessment	2 cr (S)	
PubH 6115	Worker Protection Law	1 cr (F)	
PubH 6116	Environmental Law	1 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 6132	Air, Water, and Health	2 cr (F)	
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 6451	Biostatistics II	4 cr (F&S)	
CEGE 4561	Solid Hazardous Wastes	3 cr (S)	
CEGE 5551	Environmental Microbiology	3 cr (F)	
IE 5511	Human Factors and Work Analysis	4 cr (F)	
IE 5513	Engineering Safety	4 cr (F&S)	
Kin 5001	Foundations of Human Factors/Ergonomics	3 cr (F)	
ME 5113	Aerosol/Particle Engineering	4 cr (F)	
PA 5721	Energy and Environmental Policy	3 cr (F&S)	
Other courses approved by your academic advisor			

MINIMUM TOTAL CREDITS:

52 cr

SAMPLE PLAN OF STUDY

Fall	Spring	Summer
YEAR 1		
PubH 6102 Issues in Environmental Health (2 cr) PubH 6170 Introduction to Occupational Health and Safety (3 cr) PubH 6450 Biostatistics I (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> INDUSTRIAL HYGIENE ELECTIVES (2-4 cr)	PubH 61?? New Division of Environmental Health Sciences Core Course (4 cr) PubH 6150 Interdisciplinary Evaluation of Occupational Health & Safety Field Problems (3 cr) INDUSTRIAL HYGIENE ELECTIVES (2-4 cr) <u>Even years</u> PubH 6173 Exposure to Physical Agents (2 cr) PubH 6175 Environmental Measurements Laboratory (2 cr) <u>Odd years</u> PubH 6172 Industrial Hygiene Applications (2 cr) PubH 6174 Control of Workplace Exposures (3 cr)	PubH 7196 Field Experience: Environmental Health (3 cr)
YEAR 2		
PubH 6020 Fundamentals of Social and Behavioral Science (3 cr) PubH 6320 Fundamentals of Epidemiology (3 cr) PubH 6741/2 Ethics in Public Health: Professional Practice and Policy (MPH; 1 cr) or Ethics in Public Health: Research and Policy (MS; 1 cr) <u>Even years</u> 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)	PubH 6130 Occupational Medicine: Principles and Practice (2 cr) PubH 6751 Principles of Management in Health Services Organizations (2 cr) PubH 7194 Culminating Experience: Environmental Health (3 cr) <u>Odd years</u> PubH 6172 Industrial Hygiene Applications (2 cr) PubH 6174 Control of Workplace Exposures (3 cr) <u>Even years</u> PubH 6173 Exposure to Physical Agents (2 cr) PubH 6175 Environmental Measurements Laboratory (2 cr)	

FIELD EXPERIENCE

Requirements for the Field Experience in Environmental Health (PubH 7196) are described in the Student Guidebook for the Division of Environmental Health Sciences, available at <http://www.sph.umn.edu/academics/divisions/enhs/support/>. Please read this description carefully. The field experience is an important component of the IH Program. While it is most often pursued during the summer between first and second year of the program, some students complete the requirement during the academic year.

Many options are available for fulfilling the field experience requirement, including full- or part-time employment and paid or unpaid internships. The field experience should be arranged in consultation with your academic advisor. 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 field experience opportunities are received by the faculty or Division and communicated directly to students. You are then expected to contact the location directly. It is recommended that students begin searching for an appropriate field experience during early spring semester. 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 assist in identifying specific contacts or locations.

You must discuss your field 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 in-plant work) which fully encompass the industrial hygiene principles of anticipating, recognizing, evaluating, and controlling hazards.

Field experiences should not consist of singular, office-related activities, such as reviewing safety data sheets. An example of an appropriate field 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 employees, 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

Students are expected to complete the on-line learning agreement for field experiences (<http://sph.umn.edu/students/current/fe/>) and ensure it is been approved by the preceptor, academic advisor, and major coordinator before beginning the field experience. It is highly recommended that the student discuss these expectations and the planned field experience with both the preceptor and the advisor prior to completion of the on-line form.

If expectations are not met or the job description changes during the field 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 field experience may risk receiving a failing grade in this course upon completion of the field experience.

Upon finishing of the field 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 field 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 field experience form has been completed.

Students may combine their field experience and culminating experience. This requires careful consultation with your academic advisor (who oversees the field experience), your culminating experience advisor (if different from the academic advisor) and your field experience preceptor. It is strongly recommended that a face-to-face meeting with all of the involved individuals be arranged during the early part of the field experience, in which the specific project is discussed and arranged. The field experience preceptor should receive copies of the expectations for culminating experiences from both the Division of Environmental Health Sciences Student Guidebook and the IH Program Student Handbook. Your advisors will help to ensure that the supervisor 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 culminating experience 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 Culminating Experience 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.

CULMINATING EXPERIENCE

General requirements and guidelines for the Culminating Experience (PubH 7194) are described in the Division of Environmental Health Sciences Student Guidebook and should be reviewed carefully. Specific requirements and expectations for culminating experiences in the IH Program are described here.

Students pursuing an MS degree are required to produce a research paper, which results from a single, data-based research project. Students pursuing an MPH degree may choose to complete either a research paper or a literature review. The literature review is in the nature of a critical review and typically involves some amount of data analysis and drawing inferences from the literature and the data analysis.

You should select a topic area with a culminating experience advisor who has relevant experience. Your culminating experience 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 culminating experience advisor near the start of work on the project.

Students should submit a written paper to the culminating experience advisor as soon as possible after completion of the research project. The advisor may return the paper for changes; several drafts may be required before the paper is considered acceptable. With the help of your culminating experience advisor, you should identify two additional faculty members to participate on your culminating experience 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 external to the Division (in another Division or Department) as the third member of their committee. It should also be kept in mind that all faculty must have an appointment in the Graduate School. While the requirements for the MPH are not as clearly defined, it is strongly recommended that students select a third member of their committee from outside the Division.

You should allow at least 1½ hours for your culminating experience 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 culminating experience 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, subjects from your course of study.

Research Paper Guidelines (MS or MPH degrees)

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 hazards.
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.

Literature Review Guidelines (MPH degree)

In the case of a literature review, students must pose an original hypothesis that is tested qualitatively by reviewing published, peer-reviewed research on an unresolved question in the literature to determine if the hypothesis can be accepted or rejected. Hypotheses for literature reviews must be posed on topics for which there is not yet a clear consensus. Students are expected to accept or reject their hypothesis not only on the numbers of sources on either side of the question, but also using measures to assess the quality of the sources on either side.

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., 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.

Support for Culminating Experience Research Projects

Student research can be supported in a variety of ways. If the project is performed at an external location, the work may be supported by that location. If the research 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 culminating experience advisor. Many projects do not require support. Generally, salary support for performing research should not be an expectation on the part of the student.

FACULTY INFORMATION

The faculty of the Industrial Hygiene Program includes:

Peter Raynor, PhD
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Director, Industrial Hygiene Program
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Susan Arnold, PhD, CIH
Assistant Professor
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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 (<http://sph.umn.edu/faculty1/ehs/>) and the Midwest Center for Occupational Health and Safety web site (http://www.mcohs.umn.edu/faculty_staff/index.html).

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

Your culminating 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 culminating experience advisor may occur frequently as you pursue your project.

COURSE EXEMPTION POLICY

Courses required for the Environmental Health major 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 Field Experience; an exemption to this must be approved by the academic advisor, the IH Program Director, and the School of Public Health Dean's Office.

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, medical insurance (if needed), and, during some years, stipends to most incoming MS, MPH, and PhD students who are U.S. citizens or permanent residents. It is our 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 Masters students. Availability of small levels of stipend support for students has varied from year to year. These awards do not carry any expectations with respect to an awardee's activities, other than to attend classes and maintain acceptable progress toward a degree.

MCOHS-funded MS and MPH trainees are eligible to receive support for travel and related expenses to attend the American Industrial Hygiene Conference and Exposition (AIHce) 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 AIHce are as follows:

- a. You must present a poster in the student poster session. The deadline for abstracts to this session is usually sometime in March. Check the AIHce website for more information.

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- b. You must attend at least two full technical sessions (technical paper presentations or roundtables) while at the conference.
 - c. You must attend and help out at the University of Minnesota IH Program Alumni and Friends Reception at the conference.

Other Sources of Financial Support

- 3M Company has established a paid internship program for IH Program students, which involves up to 899 hours of work conducting exposure assessments and similar activities at 3M locations. Students may use these internship experiences to fulfill their PubH 7196 Field Experience requirements. Consultation with and approval from an academic advisor are required prior to using an internship for the field experience requirement.
- 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 February each year. Visit <https://www.aiha.org/about-aiha/AIHFoundation> 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 American Industrial Hygiene Association Conference and Exposition. University of Minnesota IH Program students have been awarded this scholarships on multiple occasions. Applications are typically accepted in March of each year.
- Pilot Projects Research Training 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 summer on the Midwest Center for Occupational Health and Safety web site (<http://mcohs.umn.edu>)

MENTOR PROGRAM

The School of Public Health Mentor Program connects public health students to public health professionals to help with career and professional development. 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 15,000 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 (AIHA) is separate from membership in the local or student sections. The AIHA organizes and co-sponsors the American Industrial Hygiene Conference and Exposition (AIHce) 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, which 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, Ventilation, Air Sampling Instruments, and Air Sampling Procedures. Together with the AIHA, the organization sponsors the annual AIHce and publishes the *Journal of Occupational and Environmental Hygiene*.

American Board of Industrial Hygienists

The American Board of Industrial Hygienists (ABIH, <http://www.abih.org/>) is the certifying organization for the profession. 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.

The local North Star Chapter (see <http://www.ahmp-nsc.org/>) has a special student membership fee (you can register on-line). This organization holds regular meetings in the Twin Cities.

Institute of Hazardous Materials Management

The Institute of Hazardous Materials Management (IHMM, <http://www.ihmm.org/>) manages the Certified Hazardous Materials Manger (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 Engineers

The American Society of Safety Engineers (ASSE, <http://www.asse.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.

Product Stewardship Society

The Product Stewardship Society (PSS, <http://www.productstewards.org/>) is a new 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. It will host its first fully independent conference in November 2017.

PROFESSIONAL CERTIFICATION

Becoming a Certified Industrial Hygienist (CIH) is an important goal for many people in this profession. While this University of Minnesota 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 ABIH web site (<http://www.abih.org/>). 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

This code of ethics for the professional practice of industrial hygiene has been adopted by all of the major professional organizations for the field.

Objective

These canons provide standards of ethical conduct for industrial hygienists as they practice their profession and exercise their primary mission, to protect the health and well-being of working people and the public from chemical, microbiological and physical health hazards present at, or emanating from, the workplace.

Canons of Ethical Conduct

Industrial Hygienists shall:

1. Practice their profession following recognized scientific principles with the realization that the lives, health, and well-being of people may depend upon their professional judgment and that they are obligated to protect the health and well-being of people.
2. Counsel affected parties factually regarding potential health risks and precautions necessary to avoid adverse health effects.
3. Keep confidential personal and business information obtained during the exercise of industrial hygiene activities, except when required by law or overriding health and safety considerations.
4. Avoid circumstances where a compromise of professional judgment or conflict of interest may arise.
5. Perform services only in the areas of their competence.
6. Act responsibly to uphold the integrity of the profession.

AIHCE STUDENT POSTERS AND ABSTRACTS

As described above, if students wish to receive support for travel to the AIHce, held each year in May or June, they must deliver a poster presentation at the student poster session, usually held on Wednesday morning of the conference week. The abstract deadline for this poster session is usually toward the end of March; the IH Program faculty will inform you of the exact date when it is published. Abstracts are submitted on-line through the conference web site

What to present? Usually, posters involve work performed on culminating experience projects, although other options, such as work performed during field 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 abstract and listed as the second author.
- 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 strongly suggested that you ask your academic or culminating experience advisor to review your abstract, as 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 the standard IH Program poster format, which is available from any of the IH Program faculty members.

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 Science Accreditation Commission of ABET. The accreditation is granted in six-year blocks. The University of Minnesota has most recently received accreditation for the 2014-2020 period. 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" on your transcript.

EDUCATIONAL OBJECTIVES

The mission of the Industrial Hygiene Masters Program is to produce graduates who within three years of graduation are able to:

- Demonstrate a high level of technical and scientific competence in recognizing, evaluating and controlling occupational and environmental hazards.
- Be able to solve complex problems through a combination of observation, literature review, measurement and data analysis.
- Communicate effectively both orally and in writing with a wide range of constituents.
- Design and develop long-range goals and programs.
- Act and behave responsibly and ethically according to the industrial hygiene professional code of ethics.
- Understand the limits of their graduate education and seek on-going education and work experience for their professional advancement leading to professional certification.
- Be able to interact competently and professionally at all levels of an organization working as a fully-contributing member of a team and accepting independent work responsibilities with a high level of self-discipline.
- Use skills to benefit the community in recognizing work and environmental hazards and educating those responsible for eliminating these hazards.

PROGRAM OUTCOMES

In the broadest sense, the Industrial Hygiene Masters 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. Identify health hazards of workplace processes and operations
- R2. Understand the relationship between exposures and health outcomes
- R3. Understand, interpret and apply occupational and environmental regulations
- R4. Identify and describe quantitative and qualitative aspects of hazards associated with specific sources and processes
- R5. Describe physical and chemical aspects of the generation of hazards
- R6. Recognize the influence of cultural and social factors in occupational health practices

Evaluation

- E1. Design and initiate research
- E2. Gather, manage, and analyze data
- E3. Assess risks to population health
- E4. Interpret and apply scientific findings
- E5. Measure and evaluate health and safety programs
- E6. Understand quantitative and qualitative aspects of exposure assessments, dose response, and risk characterization
- E7. Calculate, interpret, and apply statistical and epidemiological data
- E8. Design and implement an appropriate exposure assessment strategy
- E9. Understand basic principles of air sampling and its use for evaluating exposures and controls
- E10. Understand the interpretation and use of exposure guidelines
- E11. Prioritize hazards and exposures and the actions necessary for eliminating or controlling them

Control

- Con1. Design and implement work process interventions
- Con2. Recommend, evaluate and implement appropriate engineering, administrative and personal protective controls
- Con3. Select the most appropriate hazard control method(s) for a given situation
- Con4. Validate the effectiveness of selected hazard control methods

Communication

- Com1. Communicate effectively with variety of stakeholders (e.g. management, labor, etc.)
- Com2. Produce effective written communication through scientific and technical summaries and reports
- Com3. Interpret and disseminate policies
- Com4. Design and deliver adult education programs
- Com5. Communicate effectively with other safety and health professionals

Behavior

- B1. Demonstrate awareness of diversity in social and cultural beliefs
- B2. Demonstrate the importance of appropriate ethical performance and practice
- B3. Demonstrate familiarity with and be able to use professional code of ethics
- B4. Understand and apply laws and regulations
- B5. Function effectively on an interdisciplinary team
- B6. Value professional development

Management

- M1. Work collaboratively in a team
- M2. Formulate and implement guidelines and policies
- M3. Manage resources effectively
- M4. Develop and implement health and safety programs
- M5. Display effective leadership

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 have a student 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 Twitter (@UMN_IH or https://twitter.com/UMN_IH) and keep us informed of your latest work address and email so we can keep our list current. We will update you once per semester on program happenings, and invite you to the annual alumni and friends reception at AIHce. Plus...we really want to hear what you're doing!

DOCTORAL DEGREE REQUIREMENTS

In addition to the Graduate School and Division of Environmental Health Sciences requirements for doctoral students, PhD students in the Industrial Hygiene Program are expected to have completed a Masters degree in industrial hygiene in an ABET-accredited program, or take the required courses that are part of the University of Minnesota MS or MPH degrees in industrial hygiene.

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 (see <http://www.sph.umn.edu/academics/divisions/enhs/support/>).

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 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.

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. Students present their research ideas in a closed session, and committee members will ask the students 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 students fail the exam, they may retake the examination once, if the committee members approve this option.

Final Oral Exam

After completion of their research, students 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.