Department of Environmental Sciences and Engineering

Student Handbook

20-2021 Academic Year

This document is intended to provide a quick reference for students in our department.

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I. Overview

Chair's Statement (from Barbara J. Turpin, Ph.D.)

Welcome to ESE's centennial year! And what an unusual year it is. While I write this message, I am sheltering in place to help slow the spread of a deadly virus and writing interdisciplinary proposals to better understand its environmental transmission. This work is uniquely possible at a place like Gillings, where engineering, science and public health are found together, and where health equity is a part of our mission. Addressing surprising new challenges requires a depth of knowledge, but also a willingness to teach and learn from others, to broaden your perspective, to be creative and to work collaboratively across disciplinary boundaries. You will make the most of your education when you seek out and embrace opportunities to do this.

Increasingly, the faculty and students of the Department of Environmental Sciences and Engineering (ESE) are responding to, planning for, and working to mitigate new and evolving public health threats – that oftentimes have a disproportionate impact on marginalized communities. Some of these threats include viruses transported by airborne particles, hazardous agents in contaminated floodwaters, antibiotic resistance, air pollution exposures from drought-enabled wildfires, changes in water availability in low-income countries, extreme weather-impacts on the financial health of local water districts and exposures to legacy and emerging contaminants.

Climate change will drive future challenges. During this, our centennial year, we celebrate tremendous environmental achievements and recognize the urgent need to mitigate and respond to the pressing challenges posed by global change. World Health Organization (WHO) lists climate change as the #1 threat to global health in 2019; environmental change is an important driver of WHO's top five identified threats. Notably, public health protection is central to all five pressing challenges identified in the National Academies (NRC) report on Environmental Engineering for the 21st Century. The projected impacts of climate change and antibiotic resistance on human health are expected to be particularly widespread and severe. Climate change brings droughts, floods, heatwaves and extreme weather events, which in turn impact air pollution, water availability and quality, toxic releases, food and nutrition, infectious and non-communicable diseases, and will increase migration and conflict pressure and exacerbate health inequities.

We will need integrated and holistic solutions. If anything, the past decade has shown that stove-piped responses will not deliver the long-term, sustainable results we need. Engineering solutions to household water service provision, for example, must be done within the broader context of a one-health approach to providing a disease-free living environment if we are to meaningfully reduce water-related diseases. As environmental scientists and engineers located within the top *public* school of public health, ESE is ideally positioned to provide holistic, intersectoral responses to mitigate and prepare for the pressing environmental challenges (e.g., by characterizing susceptible populations, characterizing and prioritizing health risks, examining energy policy options with co-benefits for health, engaging communities to improve resilience, and designing next-generation technologies). Thus, on the occasion of our centennial, while we celebrate a century of environmental solutions to public health problems, we affirm our commitment to build public health resilience to climate and environmental change.

ESE's history of leadership. Our work today builds on ESE's long tradition of local and global impact. We are the nation's first engineering department in a school of public health. We enrolled

our first Sanitary Engineering master's student, Roy Jay Morton, under Thorndike Saville in the fall of 1920, when there was a pronounced need to improve water safety in the towns and cities of North Carolina and also stark inequities in water, sanitation and health between white and black neighborhoods. Our public health achievements were notable, and also severely hampered by systemic racism. ESE was a founding department of UNC's School of Public Health (1940) under Herman Baity. The student body and curriculum began a substantial evolution near the 50-year mark. We began admitting women (e.g., Linda Little) and African American students (e.g., Bill Small, Otto White) and international aid organizations began sending students from several continents to be educated by the department. A 1971 survey estimated that 25% of graduates were addressing water and sanitation challenges in international health organizations and foreign governments, including African and Latin American countries. Three of the first four Directors of Environmental Health at the WHO were our alumni. Under the leadership of Dan Okun (1955-1973) and continuing under Russell Christman (1973-1989), ESE became a truly interdisciplinary department, providing a quantitative education in environmental sciences and engineering, with substantial faculty expertise spanning sciences, engineering, management and policy domains in air, water and industrial hygiene. The department's current name was adopted in 1962 and William Glaze (1989-1997) added faculty in the health sciences.

Building the next generation of leaders. Today, ESE has over 2000 practicing alumni. Our graduates take with them an integrated, interdisciplinary, quantitative, mechanistic education that links health risks back to sources. They are engaged in efforts to improve environmental quality locally and globally, including through technological innovation, effective environmental policies, research and community engagement. We have an internationally recognized faculty in air pollution, environmental health sciences, climate change and health, global water policy, infectious disease and microbiology, environmental chemistry, transport, and engineering. We are home to UNC's Water Institute, Center on Financial Risk in Environmental Systems, the Institute for Environmental Health Solutions, and participate in UNC's strong university-wide environmental and climate change communities. Since its founding, the Gillings School of Global Public Health has been a consistent advocate for health equity locally and globally.

We are particularly proud of you, our students, and of our alumni and plan to share their stories over the course of ESE's centennial year. We hope you will join us for the Centennial kick-off in fall 2020 and our main celebration on April 10, 2021. Please check back in for centennial celebration details: https://sph.unc.edu/envr/centennial-celebration/

Departmental Overview

Our department focuses on the interface between people and the environment. Interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources draw from faculty expertise in the physical and life sciences, engineering and policy. Our research strengths include:

- Characterizing exposures to contaminants in air, water, soil and workplaces;
- Developing engineering and policy solutions to environmental risks;
- Molecular approaches to understanding diseases caused by toxic substances in the environment; and
- Overcoming environmental health challenges in developing countries.

Key Personnel

Name and Title	Room	Contact
Barbara J. Turpin *Professor and Chair*	Rosenau 166A	bjturpin@email.unc.edu
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The Student Services Office is the first point of contact for any questions or concerns. A complete listing of faculty and staff is available online.

II. Degree Descriptions

The Gillings School maintains the Gillings Program Search, which outlines degree requirements, demographics, admissions information, and more. It does not supersede information on the Graduate School's Handbook, the UNC Catalog, or departmental guidelines. Prospective and current students are encouraged to contact ESE directly if they have any questions.

Graduate Degrees

Note: *At UNC-Chapel Hill, the Graduate School administers graduate degrees and is the official School for graduate students. Its regulations, as set out in the Graduate School handbook, are the final authority on academic matters.*

All graduate degrees offered by ESE involve a culminating experience – a thesis (MS), technical report (MSEE, MPH and MSPH), or dissertation (PhD). The culminating experiences provide students an opportunity to synthesize, integrate and apply knowledge and skills learned in coursework and other learning experiences and require students to demonstrate attainment of program competencies.

Upon admission, students are assigned a faculty mentor from the ESE faculty. The ESE Academic Coordinator assists the student in navigating the graduate school and departmental rules and expectations. The faculty mentor guides them in choosing an appropriate program of coursework and in forming a research committee, when appropriate. Usually, the faculty mentor will serve as the student's research advisor as well, though a research advisor from other faculty (including adjunct faculty, or faculty in other departments) may be assigned. In this case, research advisor and mentor will serve on the student's examination committee.

Master of Science (MS) Degree

The MS degree is intended for incoming students with a strong background in the sciences or engineering and prepares them for advanced education or careers in research, practice or management in the field of environmental sciences and engineering.

Competencies developed by ESE faculty define what students should know and be able to do upon completion of the MS program. Competencies guide our curriculum planning process and serve as a measure against which student achievement is assessed. Following are the degree-specific competencies for the MS in Environmental Sciences and Engineering:

- Demonstrate a depth of knowledge in one area within environmental sciences and engineering.
- Explain the results of original research.
- Review and synthesize a body of research literature.
- Demonstrate broad exposure to contemporary issues in environmental sciences, environmental health and environmental engineering.
- Demonstrate proficiency in a research skill.

Success in meeting these competencies is measured by the successful completion of all degree requirements, including course work, and a comprehensive oral examination, at which time the thesis is presented and defended. Additionally, students may prepare technical reports, present their work at seminars and at national or international meetings, and publish in peer-reviewed literature.

Our interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources offer a variety of primary and specialized courses intended to allow students to meet degree-specific competencies.

Degree Requirements:

The requirements for the MS are governed by Graduate School and include:

- A minimum of 30 semester hours of credit, which can include no more than six semester-hours of transferred credit,
- An epidemiology requirement. ENVR 601 (Epidemiology for Environmental Scientists and Engineers) is strongly recommended, although EPID 600 is also permitted. Other EPID courses may be substituted with approval of the Director for Graduate Studies.
- SPHG 600 (Introduction to Public Health),
- ENVR 400 (Departmental Seminar). *All requirements of ENVR 400 must be completed* as described in the attached link: https://weinberg.sph.unc.edu/400/index.shtml (15+ sessions must be attended and assignments completed),
- A minimum of 24 hours of formal graduate-level course work, which includes at least 15 credit hours of ENVR courses of 400 level or above (to be determined by the student and advisor to include courses providing depth in an ESE discipline),
- ENVR 991 (Research)
- A minimum of three hours of ENVR 993 (Master's Thesis), which is credit earned for the preparation and defense of a thesis; and
- A comprehensive oral examination.

The MS Course Planning Worksheet for the current year can be found here.

Master of Science in Public Health (MSPH) Degree

The MSPH is intended for incoming students with a strong background in the sciences or engineering. The MSPH prepares students for careers in practice, as well as for further studies and careers in advanced education, research or management in the field of public health with emphasis in environmental sciences and engineering. While it is accredited by the Council on Education for Public Health (CEPH) as a professional public health degree, it is focused on both public health practice and coursework, and scientific research at the interface between public health and the environment.

Competencies developed by ESE faculty define what students should know and be able to do upon completion of the MSPH program. Competencies guide our curriculum planning process

and serve as a measure against which student achievement is assessed. Following are the degree-specific competencies for the MSPH in Environmental Sciences and Engineering:

- Gain experience in practice in the fields of environmental sciences, engineering or health
- Explain and analyze the mechanisms of environmental contaminants leading to adverse effects on human organ systems
- Demonstrate awareness of contemporary research in the field of environmental sciences.
- Identify and evaluate the relationships between environmental processes, exposure and risk assessment.
- Develop skills and knowledge needed to conduct research within one area of environmental sciences and engineering

Students in the MSPH also develop core public health competencies that are fully described in the Gillings Schoolwide Handbook.

Success in achieving degree-specific and core public health competencies is measured by the successful completion of all degree requirements, including core courses in the School of Public Health; departmental course work; a practicum in the field; and a comprehensive oral examination, at which time a technical report is presented and defended. Students may also prepare other technical reports; present their work at seminars and at national or international meetings; and publish in the peer-reviewed literature.

Our interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources offer a variety of primary and specialized courses intended to allow students to meet degree-specific competencies, while the departmental and School-wide public health core courses are intended to help students achieve core and cross-cutting public health competencies.

Degree Requirements:

The requirements for the MSPH are governed by the Graduate School, the School of Public Health, and the Department. These requirements include:

- Public Health core courses (SPHG 711, SPHG 712, SPHG 713, SPHG 721, SPHG 722)
- Formation of a three-member committee to guide the student's study and research;
- A minimum of 42 semester hours of credit, which can include no more than eight semester hours of transferred credit;
- A minimum of 24 hours of formal graduate-level coursework, which includes at least 15 credit hours of ENVR coursework 400 level or above (to be determined by the student and advisor to include courses providing depth in an ESE discipline);
- Completion of ENVR 400, the Departmental Seminar. *All requirements of ENVR 400 must be completed* as described in the attached link: https://weinberg.sph.unc.edu/400/index.shtml (15+ sessions must be attended and assignments completed),
- ENVR 430;
- Completion of at least 1 credit of ENVR 981, Practicum (see below);
- A minimum of three hours of ENVR 992 (Master's Technical Report), earned for the preparation and defense of a technical report.
- A comprehensive oral examination.

The MSPH Course Planning Worksheet for the current year can be found here.

Master of Public Health (MPH) Degree with a Concentration in Environmental Health Solutions

The Gillings MPH degree is a terminal degree recognized as the standard professional degree in public health. It prepares graduates for careers in practice or management in the field of public health. Each student completes the MPH requirements and the requirements of at least one concentration (e.g. Environmental Health Solutions, Global Health, Health Equity, etc). The MPH is accredited by the Council on Education for Public Health(CEPH) as a public health degree.

More information about the MPH is provided in the Gillings MPH Handbook Herein, we only provide information about requirements for the Gillings MPH with a Concentration in Environmental Health Solutions.

Competencies developed by ESE faculty define what students completing a concentration in Environmental Health Solutions should know and be able to do beyond the MPH core competencies. Competencies guide our curriculum planning process and serve as a measure against which student achievement is assessed. Following are the concentration-specific competencies for Environmental Health Solutions:

- Weigh the scientific basis of hazard identification, exposure and health risk assessment to support environmental management and policy.
- Identify and evaluate the relationships between sources of environmental contaminants and processes that affect the movement, transformations, exposure pathways and health effects of contaminants in environmental systems.
- Describe and critically evaluate the rationale for and approaches used to measure and model properties of environmental/ human systems.
- Evaluate effective actions or interventions that improve environmental health outcomes, and be able to compare and assess programs, policies, engineering solutions and/or other approaches to achieve these outcomes.
- Examine and critique ethical and legal dimensions of public health and environmental interventions on individuals and communities.

Success in achieving concentration-specific and core public health competencies is measured by the successful completion of all degree requirements, including core courses in the School of Public Health; required concentration course work; an oral comprehensive exam, a 200-hour practicum in a public health setting; and a culminating experience leading to a high-quality written product.

Our interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources offer a variety of primary and specialized courses intended to allow students to meet degree-specific competencies while the departmental and School-wide public health core courses are intended to help students achieve core and cross-cutting public health competencies.

Degree Requirements

The requirements for the Gillings MPH are governed by Graduate School requirements, and School of Public Health requirements. Details for the Gillings MPH can be found here. Requirements for students pursuing the Concentration in Environmental Health Solutions can be found here.

Master of Science in Environmental Engineering (MSEE) Degree

The MSEE degree is a terminal degree intended for students interested in careers in environmental engineering practice. It is open only to those who possess an ABET-accredited (or equivalent) engineering degree.

Competencies developed by ESE faculty define what students should know and be able to do upon completion of the MSEE program. Competencies guide our curriculum planning process and serve as a measure against which student achievement is assessed. Following are the degree-specific competencies for the MSEE in Environmental Sciences and Engineering:

- Define problems, needs, and objectives for which environmental engineering is relevant
- Evaluate problems quantitatively using measurements or models (statistical, empirical, and/or mechanistic) of engineered systems or impacted natural environments.
- Develop and design appropriate solutions which use technologies, facilities, monitoring, controls, or policies to solve environmental engineering problems.
- Evaluate the success of environmental engineering designs and assess the uncertainty involved in environmental systems.
- Obtain a broad exposure to contemporary issues in environmental sciences, environmental health, and environmental engineering.

Success in achieving these learning objectives is measured by the successful completion of all degree requirements, including formal course work and a comprehensive oral examination, at which time the master's technical report is presented and defended. Students may elect to take a professional track degree with an anticipated completion in one year. For professional track students, their master's technical report is an extension of work performed in the capstone (ENVR 992.03 Global Environmental Crisis Management with master's technical report).

Students may instead choose to pursue a research track under the guidance of a research advisor. Students on a research track will present and defend their research, and document their research in their master's technical report. They will register for the section of ENVR 992 associated with their research advisor. Research students are anticipated to complete the MSEE degree in two years. Students may also prepare other reports; present their work at seminars and at national or international meetings; and publish in the peer-reviewed literature.

Our interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources offer a variety of primary and specialized courses intended to allow students to meet degree-specific competencies. This webpage gives examples of coursework and activities through which students can meet the degree-specific competencies associated with the MSEE.

Please refer to the MSEE website (https://sph.unc.edu/envr/msee-program/) for the latest listings of courses. The website shows the courses listed as engineering electives and general electives that can be chosen. There are other courses in ESE that may be of interest to students in the MSEE program. Note that the general electives do not count toward the 12 hours of engineering coursework required for the MSEE degree.

Degree Requirements

The following requirements must be met for the Professional Track MSEE:

(1) Students and their advisors should develop a written coursework plan during the first semester of study.
(2) Students must complete at least 12 hours of engineering coursework (listed on the MSEE page) offered in the Department of Environmental Sciences and Engineering or graduate-level engineering courses from another institution. Courses taken at another institution must be approved by the student's advisor, and must not have counted toward an undergraduate degree elsewhere, if they are to count towards this requirement.
(3) Students who have not already had an undergraduate or graduate course in probability and statistics and an undergraduate or graduate course in the biological sciences must take an appropriate course on each topic while in the MSEE program. The acceptability of courses to fulfill these requirements should be decided after consultation with the student's advisor. Courses below 400 level can meet this requirement but do not count toward graduate credit.
(4) MSEE student committees must include three members, at least two members must be from among the environmental engineering faculty. At least one committee member must hold a degree in engineering as noted in the list of engineering faculty.
(5) MSEE students must meet all other requirements of the Department, Gillings School of Global Public Health and the Graduate School. These requirements include:

- SPHG 600 Introduction to Public Health (School requirement)
- ENVR 400, ESE Seminar (1 credit) (Departmental requirement) – attend 15 seminars and complete assignments as detailed in the syllabus.
- ENVR 601 or EPID 600 epidemiology (3 credits) (School requirement)
- ENVR 992.03 Global Environmental Crisis Management with master's technical report (3 credits) (Graduate School requirement)
- A minimum of 24 credits in formal coursework (Departmental requirement) including 12 credits of engineering electives (Departmental requirement)
- A minimum of 30 credits (Graduate School and Departmental requirements)
- A minimum of 24 credits in residence; i.e., credit obtained through registration at UNC- CH (Graduate School requirement)

(6) In accordance with Graduate School rules, up to six credits toward the MSEE degree requirements can be transferred from graduate courses taken at a previously-attended institution if the course(s) were not counted toward requirements for the undergraduate degree.

Requirements for a Professional Track Master's Technical Report

All students on the professional track are required to take the experiential course Environmental Crisis Management (ENVR 992.003). This will be a culminating experience that features a multi-disciplinary team and a real-time simulation of environmental and humanitarian emergencies such as a train derailment, major chemical spill, disease outbreak, or population displacement.

An integrated Technical Report is required. This focuses on either a problem during the Environmental Crisis Management course or a separate engineering problem. In addition to the Technical Report, the project will be defended orally as a final comprehensive examination.

The course planning worksheet for the MSEE professional track can be found here.

The following requirements must be met for the Research Track MSEE:

(1) Students and their advisors should develop a written coursework plan during the first semester of study.
(2) Students must complete at least 12 hours of engineering coursework offered in the Department of Environmental Sciences and Engineering (see attached list) or graduate-level engineering courses from another institution. Courses taken at another institution must be approved by the student's advisor, and must not have counted toward an undergraduate degree elsewhere, if they are to count towards this requirement.
(3) Students who have not already had an undergraduate or graduate course in probability and statistics and an undergraduate or graduate course in the biological sciences must take an appropriate course on each topic while in the MSEE program. The acceptability of courses to fulfill these requirements should be decided after consultation with the student's advisor. Courses under 400 level may be used to fulfill this requirement but will not count toward graduate level credits.
(4) MSEE student committees must include at least three members; two members must be from among the environmental engineering faculty. At least one committee member must hold a degree in engineering as noted in the list of engineering faculty.
(5) MSEE students must meet all other requirements of the Department, Gillings School of Global Public Health and the Graduate School. These requirements include:

- SPHG 600 Introduction to Public Health (School requirement)
- ENVR 400, ESE Seminar – *All requirements of ENVR 400 must be completed* as described in the attached link: https://weinberg.sph.unc.edu/400/index.shtml (15+ sessions must be attended and assignments completed),
- ENVR 989, Environmental Crisis Management (Departmental requirement)
- ENVR 601 or EPID 600 epidemiology (3 credits) (School requirement)
- A minimum of three credits for ENVR 992, Master's Technical Report (Graduate School requirement)
- ENVR 992, masters technical report, section assigned to their research advisor
- A minimum of 24 credits in formal coursework (excludes credits for research, ENVR 992) (Departmental requirement), including 12 credits of engineering electives (Departmental requirement)
- A minimum of 30 credits total (Graduate School and Departmental requirements)
- A minimum of 24 credits in residence; i.e., credit obtained through registration at UNC- CH (Graduate School requirement)

(6) In accordance with Graduate School rules, up to six credits toward the MSEE degree requirements can be transferred from graduate courses taken at a previously-attended institution if the course(s) were not counted toward requirements for the undergraduate degree.

Requirements for Research Track Master's Technical Report
Research leading to a masters technical report and oral defense serves as the culminating experience required by the Graduate School and CEPH

The course planning worksheet for the MSEE research track is attached.

Doctor of Philosophy (PhD) Degree

The PhD, a terminal degree, is intended for students with a strong background in the sciences or engineering and prepares graduates for careers in basic and applied research, education, advanced practice, and management in the field of environmental sciences and engineering. Research, and publication in peer-reviewed journals, is a major focus of a PhD education.

Competencies developed by ESE faculty define what students should know and be able to do upon completion of the PhD program. Competencies guide our curriculum planning process and serve as a measure against which student achievement is assessed. Following are the degree-specific competencies for the PhD in Environmental Sciences and Engineering:

- Identify key knowledge gap(s), integrate knowledge, and design sound research strategies to fill gap(s) in knowledge in a specific area within environmental sciences and engineering.
- Develop the ability to critically evaluate environmental sciences and engineering research.
- Demonstrate depth of knowledge in a specific area within environmental sciences and engineering to support success in research.
- Develop skills to successfully execute a research design within the discipline of environmental sciences and engineering.
- Develop the ability to present/communicate environmental sciences and engineering research results formally to a broad audience.

Success in achieving these learning objectives is measured by the successful completion of all degree requirements including formal course work; a comprehensive written examination; a preliminary oral examination; preparation of a dissertation; and final oral defense of the dissertation. All PhD students prepare a research proposal and present their work in the Departmental Seminar (ENVR 400). Although not a requirement, most will present their work at national and international meetings and publish in the peer-reviewed literature.

Our interdisciplinary programs in air quality and atmospheric processes, human exposure and health effects, and sustainable water resources offer a variety of primary and specialized courses intended to allow students to meet degree-specific competencies.

Degree Requirements

The requirements for the PhD are governed by the Graduate School and ESE and include:

- Formation of a five-member (or more) committee tailored to the student's area of interest that guides all aspects of the student's study and research. A majority of the committee must be regular faculty at ESE, though an exception may be requested from the Graduate School via a written request from the Director of Graduate Studies;
- Mastery of a depth of knowledge in a particular area of environmental health, sciences or engineering, consisting of at least 15 credits of courses approved by the student and their committee;
- Mastery of two research skills, to be determined by the student and their committee. This requirement can be met by taking two courses, hands-on workshops or other trainings leading to certification, for example in various modeling software, or operator training on specialized instrumentation;
- ENVR 400, the Departmental Seminar (for PhD students, this requires a seminar presentation, attendance at 30 seminars, and completion of required assignments; *see*: https://weinberg.sph.unc.edu/400/index.shtml
- SPHG 600 (Introduction to Public Health);
- EPID 600 or ENVR 601 (higher level epidemiology courses can be substituted with approval of the Director of Graduate Studies);
- ENVR 703, Proposal Writing for Environmental Research, preferably taken in the second year;
- ENVR 704.01 Critical Analysis of Environmental Research, preferably taken in the first year;
- ENVR 704.02, Critical Analysis of Environmental Research, preferably taken in the second year;
- Completion of a comprehensive written examination to test student's knowledge and evaluate preparation for dissertation research;
- Completion of an oral exam defending the student's research proposal;
- Completion of a significant and original body of research, which requires a minimum of six semester hours of ENVR 991 (Research in ESE) and a minimum of six hours of ENVR 994 (Doctoral Dissertation); and
- Preparation, presentation, and defense of the research dissertation.

An *approximate* timeline for Ph.D. students at ESE is shown below:

	Semesters after matriculation
1. Admission	0
2. Appoint Advisor	0
3. Outline course program	1 – 2
4. Select dissertation topic	2
5. Select dissertation committee	2
6. Approve course program	2 – 3
7. Complete course work	3 – 4
8. Residency requirement met	3 (students are encouraged to apply earlier)
9. Doctoral written examination (qualifying)*	3 – 5
10. Doctoral oral examination (qualifying)	4 – 6
11. Completion of research	7
12. Advisor approves dissertation draft	8
13. Final oral examination and dissertation defense	8
14. Graduation	8 – 10

*The following is ESE policy regarding credits necessary to maintain status as full-time student: Once a PhD student's Dissertation Committee has certified that the student's coursework has been completed, he/she has passed the doctoral written exam, and the coursework/exam paperwork is on file with student services, the student will be considered full time as long as the student is registered for a minimum of 3 credits of ENVR 994. Students must be registered for a minimum of 3 credits of ENVR 994 when they take their preliminary oral exam (dissertation proposal defense).

PhD Worksheet

Dual Degrees

Dual BS/MS, BSPH/MS, BS/MSPH, BSPH/MSPH, BS/MPH, BA/MPH and BSPH/MPH Degrees

Any STEM student on campus (BS or BSPH) is eligible to apply for a dual bachelors plus master's degree at ESE. BA students may also apply for a dual bachelors plus MPH degree with adequate completion of STEM courses. With careful planning, in many cases this allows a student graduating from UNC-Chapel Hill to complete a master's degree in a single year beyond the bachelor's. To participate, a graduating UNC student must have:

- 9 (MS) or 12 (MSPH or MPH) graduate-level (400 or above) credits beyond any requirements for their bachelor's program(s) to transfer into their master's program. (Credits may not be "double-counted" for an undergraduate major or minor and for the masters.)

- In the case of the MS and MSPH, a willing research advisor. Interested students should strive to identify an advisor as soon as possible, preferably by the fall of their junior year. This enables a student to begin research on the thesis project well before formally starting the master's

- In the case of the MS or MSPH, a STEM major from UNC-Chapel Hill (BS or BSPH).

A student should apply as early as possible in the senior year (preferably for Spring; the

application is then deferred to Fall). The applicant should also fill out a course check sheet/contract form, available on the "Students" section of the ESE website.

The overall requirements for any dual bachelors plus master's degree are the same as for the regular master's degree (outlined above for each master's degree). Likewise, the degree-specific competencies are the same as the corresponding stand-alone master's degree (given above; and below in the appropriate appendix) and the measures of success in mastering competencies are identical between corresponding degrees. Additional details are described below.

Timing issues for students considering the dual degree program

- Three to four semesters before anticipated completion of Bachelor's program: plan coursework to accommodate all Bachelor's degree requirements and the transferable graduate credits; meet with the Director of Graduate Studies to verify program requirements; begin to identify a research advisor in ESE. Begin to complete the +1 Course Check Sheet and Contract and submit it to the ESE Student Services Office.

- First semester of final year of Bachelor's program: apply to dual degree program; finalize identification of research advisor in ESE.

- Begin attending ENVR 400 beginning senior year. After you have completed the contract for admission to the dual degree program (see link above) you should request that Student Services to send your name and PID to Dr. Weinberg to enroll you in ENVR 400. Once you have been assured that your name has been forwarded to Dr. Weinberg, begin attending ENVR 400 seminars (http://www.unc.edu/~weinberg/400/). ***If your name has not been moved forward, your attendance at ENVR 400 seminars will not be recorded.***

- Plan coursework for dual degree year with ESE's Academic Coordinator and faculty mentor.

Students are encouraged to get in touch with the Student Services Office if they are interested in a bachelors-to-masters program. A course check sheet and degree course planning worksheets are required to be submitted to the Office in the Fall of the student's senior year, outlining the student's degree, advisor, courses that will be transferred and a plan for completion of requirements.

Dual Master's Programs with City and Regional Planning

The Department offers dual degrees with UNC-Chapel Hill's Department of City and Regional Planning (CRP), one of the oldest and most distinguished of its kind in the country. This allows a student to finish a CRP masters and an ESE MS or MSEE typically within three years. A dual degree with the MSPH is also possible, but may take longer. Students must fulfill the requirements of both degrees, though a single final research project can count for both departments, as long as it fulfills both sets of requirements. Typically, a student would spend one year in one department, the next in the other, and the final year finishing off the requirements for both degrees. Nine credits (for the MS and MSEE) or twelve credits for the MSPH may be cross-credited. Students should be sure to communicate with the Academic Coordinator for both departments near the end of each year, to ensure that matriculation into each department goes smoothly.

Students can, but need not, be admitted to both degrees simultaneously – i.e. a student could spend one year in one program before applying to the other, or a student could be admitted into

one and decide later that they wish to embark on the other. However, admission to the two (ESE and CRP) degrees is a separate process.

- As with dual degree programs offered entirely within ESE (above), degree requirements, degree-specific competencies and measures of success in mastering competencies are the same as those for the corresponding stand-alone master's degree. ***In particular, this requirement extends to completion of ENVR 400***, the ESE Seminar Series (1 credit, pass/fail). **Students should begin attending ENVR 400 seminars as soon as possible.** Students are expected to sign in, attend 15 seminars, and complete associated assignments. See: https://weinberg.sph.unc.edu/400/index.shtml

Attendance at ENVR 400 seminars will be allocated toward the attendance requirement after the student has been admitted to the dual degree program. Students register for ENVR 400 in the semester during which the minimum cumulative attendance requirement (15 seminars) will be achieved.

Students are encouraged to get in touch with the Student Services Office if they are interested in the dual degree program with CRP.

Graduate Degree Requirements at a Glance

Degree	MSPH	MSEE	MS	PhD
Minimum Credits Required for Graduation	42	30	30	No minimum overall, includes research skill, research hours and dissertation
ENVR 400 *	≥15 Seminars attended & feedback	≥15 Seminars attended & feedback	≥15 Seminars attended & feedback	≥30 Seminars attended, feedback, plus a Seminar presentation
Formal Coursework	≥24 credits	≥24 credits	≥24 credits	No minimum – ~2 years of graduate coursework
Graduate Coursework in ENVR	≥15 credits	≥15 credits	≥15 credits	No minimum
Engineering Coursework		≥12 credits		
Research Skill				2 Certified skills (up to 6 credits)
Formal Minor (Optional)**	≥9 credits	≥9 credits	≥9 credits	≥15 credits
Public Health Core***	REQUIRED			
Practicum (ENVR 981, 1+ credits)	REQUIRED			
Introduction to Public Health Course (SPHG 600)		REQUIRED	REQUIRED	REQUIRED
Coursework in Epidemiology‡		REQUIRED	REQUIRED	REQUIRED
Research Hours (ENVR 991)	≥3 credits		≥3 credits	≥6 credits
Master's Technical Report (ENVR 992)	≥3 credits	≥3 credits ENVR 992 or ENVR992.03		
Master's Thesis (ENVR 993)			≥3 credits	
Doctoral Dissertation (ENVR 994)				≥6 credits
Committee††	≥3 members	≥3 members	≥3 members	≥5 members

*Note feedback requirements on ENVR 400 website (syllabus)
**These credits are taken in addition to ENVR requirements
***Consists of SPHG 711, SPHG 712, SPHG 713, SPHG 721, SPHG 722
‡This may be EPID 600, ENVR 601, or another advanced EPID course approved by DGS
††The committee works with the student to tailor and approve each student's 1) program of courses, 2) research plan, 3) track progress to degree, and 4) assess the written and oral thesis, technical report or dissertation

III. Academic Reminders

ENVR 400

MPH students are encouraged, and all other ESE graduate students are required to meet the following seminar requirement for graduation:

- For students pursuing masters degrees - receive credit for 15 seminars (with feedback) in the In-house ENVR 400 Seminar Series within the time period to complete degree.
- For students pursuing doctoral degrees - receive credit for 30 seminars (with feedback) in the In-house ENVR 400 Seminar Series with at least 15 before admission to candidacy, and present a seminar in the series no later than the semester before the one in which you plan to defend your dissertation. Seminar credits received by students while on the Masters track in this department carry over to the PhD track. Students are strongly encouraged to begin meeting this requirement in the first semester of their program.

Note that there is a feedback requirement as well (please see the ENVR 400 website for details and the complete rules).

Each semester the department offers between 8 and 10 seminars in the ENVR 400 series at a fixed time and place. See the ENVR 400 webpage for location and time.

The credit requirements for both Masters and Doctoral degrees are validated by the student enrolling in ENVR 400 **once** during each degree – **not** in each semester they are attending and providing feedback. This is usually the student's final semester, or the semester in which they will fulfill their requirement, whether it is the master's or doctoral. At the end of the semester of enrollment and provided all other requirements have been met, the credit sheet will show a "Y" in the two far right columns indicating that the student is cleared for graduation. If they do not meet the requirement in the semester they are enrolled, they will receive an incomplete that will require them to meet the seminar requirement within the next 12 months. If the student does not meet the requirement he/she will not be permitted to graduate.

Students **must** bring their One Card and have it scanned in by the TA – if there is no scan, no credit will be recorded for the seminar. Late arrival (i.e. after completion of the introduction of the speaker) or early departure invalidates the student's participation in a seminar. No substitutions of other seminars will be accepted.

The seminars are intended to provide the students with exposure to the breadth of research activities in the Department. Graduate students, post-docs, and faculty members will present seminars on a variety of topics. The seminars also provide an opportunity for doctoral students to gain experience with oral presentations of their research aimed at a diverse audience. The enrollment requirement is in place to encourage students to support their colleagues in this endeavor, to provide feedback to them, and to ask questions to gain a better understanding of their work.

If you have any questions related to the course requirements, please contact Dr. Howard Weinberg.

Practicum in Public Health

MSPH and MPH students must complete a practicum as part of their program (this is a Council on Education for Public Health requirement and only applies to "PH" degrees. MPH students must complete a 200-hour practicum. MSPH students must take a practicum of 45 hours (1 credit) or more. Please see details here.

The practicum is a planned, supervised and evaluated practice experience. The student will carry out a meaningful environmental health-related task or project in a professional setting, under the supervision of a qualified Preceptor who is a practicing Public Health professional and is identified ahead of time. The practicum may be paid or unpaid. For MSPH, ENVR 981 may be taken for a variable number of credit hours (minimum 1 credit), depending on the scope and duration of the proposed practical experience. Each ESE faculty member will have a section identified for this course and may serve as instructor/Departmental Representative (see below). A Practicum Committee consisting of at least three members of the ESE Faculty will oversee administration of the Practicum. The student must register for ENVR 981 for at least one semester before graduation, and may register for more than one semester. The experience is:

- planned by the student, the Department Representative and the Preceptor;

- supervised by the Preceptor; and

- evaluated by the Department Representative, the Preceptor, and the student.

The Preceptor must be a qualified professional in a field relevant to public health. Most preceptors are expected to be external to the University but can also be a credentialed faculty or staff member (such as a Certified Industrial Hygienist).

Planning and Supervision. Planning should include identification of the competencies to be achieved. The Department Representative will usually be the student's Faculty Mentor. When the Faculty Mentor or an acceptable substitute is not available, the Director of Graduate Studies or the Chair of the Practicum Committee will be designated to fill this role.

The format of the practicum experience is flexible. The fundamental requirement is that the basic stipulations (planned, evaluated and supervised, in a Public Health context) be met. Placements may be on an ad hoc basis consistent with the student's own initiative, through professional contacts of the student's Faculty Advisor, or arranged through the offices of the Practicum Committee. Examples of appropriate experiences include:

• Service projects undertaken at the request of external organizations such as Health Departments or community groups. The possibility of this type of placement occurs regularly (but unpredictably) in response to outbreaks of environmentally-transmitted disease outbreaks (e.g., Hepatitis A, Norovirus) or local sanitation issues (e.g., air or water quality issues, solid or liquid waste disposal). A qualified Preceptor can usually be identified from among the Health Department staff or Community Organizers.

• Volunteer outreach projects under the auspices of organizations such as Engineers Without Borders (EWB), a volunteer organization that partners with communities (typically in the developing world) to design, implement and maintain sustainable projects aimed at providing drinking water, sanitation, energy, and other necessities selected by the community. The UNC-Chapel Hill's Daniel A. Okun Chapter has current projects in Peru, Ecuador, Mexico and Moldova, and is providing technical support to the local Rogers-Eubanks Neighborhood Association on water and sanitation issues.

• Field experiences in on-site data collection. These may involve both an internal professional preceptor and an external preceptor. Examples of these have included:

- Occupational Hygiene. For example, sampling of airborne contaminants at workplace sites such as auto body shops or pesticide application areas.
- Environmental sampling in the vicinity of concentrated animal feeding operations (CAFOs), which are a health problem in eastern North Carolina.

• Internships with agencies such as water and energy utilities, environmental consulting firms, Public Health and Environmental Health Departments, non-governmental organizations (NGOs), federal agencies (e.g., US Environmental Protection Agency, National Institute for Environmental Health Sciences, Centers for Disease Control and Prevention), or international agencies (e.g., World Health Organization). These include paid positions such as Student Contractor and competitive summer internships. The Preceptor would usually be the workplace supervisor.

• Participation in a Project-based Course to which an external professional contributes substantially.

• Public Health Practice (PHP) component of a student's master's technical report project. Placement would usually be arranged through the student's Faculty Advisor. Agencies such as those identified above under Internships may provide suitable environments.

Opportunities such as Service Projects, Project-based Courses, and Internships are sometimes advertised through the ESE Student Services Office and administered (i.e., participant selection, matching) through the Practicum Committee. Field experiences and PHP research components will be arranged by the respective Faculty Advisor.

Documentation. The student shall keep a log of the hours dedicated to the practical experience that must include at least the following information: date, number of hours, and brief description of the tasks performed on each day. The log shall be signed by the student and the Preceptor, and submitted to the Department Representative and the ESE Student Services Office at the end of the semester. This document shall remain part of the student's file.

Evaluation. At the end of the practicum the student should turn in to the ESE Student Services Office an exit survey, adapted from current course evaluation forms. A 2-3 page paper in which the context, goals, accomplishments and impact of the practicum experience are succinctly and thoughtfully summarized should be submitted to the Department Representative and the Preceptor. This paper should, if appropriate, be incorporated into the section of the student's Technical Report in which the public health relevance and impact of the student's work is discussed. The student's committee is encouraged to pay especial attention to this section when evaluating the student's Technical Report. Additional evaluation criteria may be established by each instructor and, if any, communicated to the students registering for that instructor's section of ENVR 981 at the beginning of the relevant semester. The Department Representative and the Preceptor in consultation award a grade for the course based, in part, on the paper and any additional evaluation criteria (see above).

Course Credit will be awarded for ENVR 981 (in the case of the MSPH) based on the time and effort commitment on the part of the student. Forty-five (45) hours of active effort will be considered equivalent to one credit hour. Since the level of effort may not be predictable at the outset (particularly for service projects), the student should register for a conservatively low number of credits at the outset,

and adjust registration in subsequent semesters as appropriate.

Completion of the MSPH practicum requirement is documented by the UNC School of Public Health Student Practicum Form, which includes: Proposed Title and Activities (200 words), List of Cross-cutting Competencies to be developed during the Practicum, and List of Discipline- specific Competencies to be developed during the Practicum. This form is to be filled in both prior to the practicum experience (when the competencies to be achieved are being planned) and after the experience has ended. At this time the activities and competencies actually achieved, and the duration of the practicum, will be reported.

Finishing and Graduation

All graduate programs offered by the Department of Environmental Sciences and Engineering require the completion of a culminating project and high quality written product. Doctoral students write a dissertation, MS students a master's thesis, and MSPH, MPH and MSEE students complete a technical report. Submission guidelines are as follows.

Thesis (MS) and Dissertation (PhD)

Please refer to the graduate school's submission instructions. After the thesis or dissertation is revised to the faculty advisor's satisfaction, the student will upload it to the ProQuest Theses and Dissertations database (note that there is a fee). The Graduate School will review it before it is published and may require some revisions (usually formatting) from the student.

The Department's student services office needs the confirmation email from the submission system, and notification from the advisor that it was ready to submit before any paperwork is processed.

Technical Report (MSPH, MPH, MSEE)

The Department requires that the student submit:

1) a digital (PDF) copy uploaded to the Carolina Digital Repository using this form. These will be checked by the student services office before being published on the CDR site. Embargoed reports will become "active" in the system after the embargo ends.

2) the student should check with their advisor to see whether they want a paper copy.

BSPH Honors students who write an honors thesis upload their thesis to the Carolina Digital Repository; they receive instructions on how to do this in due course.

The Graduate School has strict formatting guidelines for theses and dissertations; these are available on their website. MSPH, MPH, and MSEE students are strongly encouraged to adhere to these guidelines when submitting their technical reports.

Guidelines for Formatting Theses, Dissertations and Technical Reports

Theses, Dissertations and Technical Reports should follow the formatting guidelines as laid out in the Graduate School's Thesis and Dissertation Guide.

Guidelines for Submitting Theses, Dissertations and Technical Reports

These are currently outlined on the Submission of Final Work webpage. Currently, technical reports (MSEE, MSPH, MPH) are submitted to the Carolina Digital Repository; theses and dissertations (MS, PhD) are uploaded to the ProQuest database through the Graduate School.

IV. Helpful Information

Courses

A current listing of courses is available on our department's course page.

Inter-Institutional Registration

UNC-Chapel Hill has inter-institutional agreements with Duke University, North Carolina State University, North Carolina Central University, and the UNC Campuses in Charlotte and Greensboro. More information is located here on the registrar's website. The form must be signed by the student and their advisor before being submitted to the Student Services Office.

Faculty Research Interests

Please see our faculty research page here.

Declaring a Minor or a Second Major

To declare a minor, **undergraduate students** at the Gillings School of Global Public Health must fill out the form on the Office of Student Affairs' website, and bring it to the ESE Student Services Office. The procedure for declaring a second major is quite different, and it is also located this page (note that this should be completed before the beginning of the student's junior year).

To request a minor, **graduate students** must fill out the appropriate form ("Minor Declaration Form" on the Graduate School's forms page, and bring it into the student services office. Note that the courses in the minor field must be completed *in addition* to ESE requirements for the graduate degree, as per the Graduate School's handbook.

Waiving School of Public Health Requirements

Students may petition to waive School of Public Health course requirements if they possess the appropriate background, or they may substitute other courses in certain circumstances. More information is available on the Academic Forms and Policies website.

MS, MSEE and PhD students with previous public health degrees do not need to meet the SPHG 600 requirement.

Residency and Tuition Remission

The state of North Carolina distinguishes between residents and non-residents for tuition purposes. Non-residents must pay an out-of-state portion of tuition.

Information on residency is located on the registrar website. Non-residents are strongly encouraged by the Department to apply for residency as soon as they can. It is possible to obtain residency shortly after a year of living in North Carolina, but only if a substantial number of tasks (e.g. registering a vehicle, registering to vote, paying taxes in North Carolina) are completed within a short period of time after moving to the state. The intent of this process is to demonstrate that the student is intending to set up domicile in North Carolina – not simply live here to go to university.

International students cannot apply for residency, though permanent residents of the United States can (see the North Carolina State Residence Manual linked to from the Graduate School's website for more information).

Insurance

If a student is on the RA/TA/Fellow (GSHIP) plan, they must waive the compulsory UNC insurance every semester. If a student is on other insurance (e.g. a spouse's) they must waive the compulsory UNC insurance every semester.

Otherwise, the student will be enrolled in the regular student plan (and be billed accordingly

RAs, TAs and Fellows who are on the GSHIP should fill out the 1112.1.1f UNC-CH Graduate Student Health Insurance Program form and submit to the Student Services Office as soon as they can, preferably before August.

Note that for students graduating or coming off payroll, the GSHIP is cancelled quite soon afterward (the end of May for May graduates, or for those coming off payroll in May), so they should make other arrangements as soon as they can, whether through an employer or through the marketplace. Continuing students who are coming off payroll in May should know that university insurance will only be renewed in August. This is an issue yet to be addressed by the university.

Policies for Changing Degree Programs and Advisors

With the exception of the MPH, current students may change their master's degree program with the permission of their advisor. Changes may have implications to the time-to-degree.

Master's students interested in moving from a master's to a doctoral program should consult with their faculty advisor and the student services office. The Graduate School offers two options: proceeding beyond the master's, and bypassing the master's completely. The student is encouraged to talk with their advisor about which option to take.

Students may change their academic or research advisor if they find a willing new advisor to take them on. There is no formal process for this, but students should consult with their current advisor, particularly if they are being funded through a research assistantship with that advisor. Funding does not necessarily follow. Issues that arise between a student and advisor may be addressed with the Director of Graduate Studies, if they cannot be solved between the student and advisor directly.

Room and Audio/Video (AV) and Other Equipment Reservations

More information is located on the Gillings website.
Other equipment for check out as well as audio and video editing facilities are located in the basement of the House Undergraduate Library [link here].

Poster Printing

ESE owns a poster printer available for the use of ESE-affiliated students, staff and faculty. It is located in Rosenau 149. Information on booking the printer is available. Gillings also has printing options for students.

V. Appendix – Competencies at a Glance

MSPH	MS	MSEE	MPH	PhD
Gain experience in practice in the fields of environmental sciences, engineering or health (practicum, ENVR 981)	Demonstrate a depth of knowledge in one area within environmental sciences and engineering (specialized courses)	Define problems, needs, and objectives for which environmental engineering is relevant (ENVR989)	Weigh the scientific bases of hazard identification, exposure and health risk assessment to support environmental management and policy (ENVR430 and ENVR500)	Identify key knowledge gap(s), integrate knowledge, and design sound research strategies to fill gap(s) in knowledge in a specific area within environmental sciences and engineering ENVR 703)
Explain and analyze the mechanisms of environmental contaminants leading to adverse effects on human organ systems (ENVR430)	Explain the results of original research (thesis defense)	Evaluate problems quantitatively using measurements or models (statistical, empirical, and/or mechanistic) of engineered systems or impacted natural environments (ENVR989)	Identify and evaluate the relationships between sources of environmental contaminants and processes that affect the movement, transformations, exposure pathways and health effects of contaminants in environmental systems (ENVR 430 and 500)	Develop the ability to critically evaluate environmental sciences and engineering research (ENVR 704)
Demonstrate awareness of contemporary research in the field of environmental sciences (ENVR400)	Review and synthesize a body of research literature (ENVR601 or other coursework)	Develop and design appropriate solutions which use technologies, facilities, monitoring, controls, or policies to solve environmental engineering problems (ENVR989)	Describe, and critically evaluate the rational for and approaches used to measure and model properties of environmental/ human systems (ENVR430 and 500)	Demonstrate depth of knowledge in a specific area within environmental sciences and engineering to support success in research (15 credits designed by student and committee)
Identify and evaluate the relationships between environmental processes, exposure and risk assessment (specialized coursework)	Demonstrate broad exposure to contemporary issues in environmental sciences, environmental health and environmental engineering (ENVR400)	Evaluate the success of environmental engineering designs and assess the uncertainty involved in environmental systems (ENVR989)	Evaluate effective actions or interventions that improve environmental health outcomes, and be able to compare and assess programs, policies, engineering solutions and/or other approaches to achieve these outcomes (ENVR580)	Develop skills to successfully execute a research design within the discipline of environmental sciences and engineering (2 courses, workshops, or training leading to certification of skill)
Develop skills and knowledge needed to conduct research within one area of environmental sciences and engineering (specialized courses)	Demonstrate proficiency in a research skill (research training or coursework)	Obtain a broad exposure to contemporary issues in environmental sciences, environmental health, and environmental engineering (ENVR400)	Examine and critique ethical and legal dimensions of public health and environmental interventions on individuals and communities (ENVR580)	Develop the ability to present/communicate environmental sciences and engineering research results formally to a broad audience (ENVR 400)