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Environmental Engineering Undergraduate Handbook 2026-2027

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

The Grainger College of Engineering
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Preface

The Environmental Engineering Undergraduate Handbook records all the requirements associated with earning the degree of Bachelor of Science (B.S.) in Environmental Engineering at the University of Illinois Urbana-Champaign (U. of I.). The Department of Civil and Environmental Engineering (CEE) administers the degree program. This handbook also contains other useful information related to studying environmental engineering, being a student in our department, and planning for your future.

The Environmental Engineering Undergraduate Handbook is revised annually to reflect changes in requirements and other relevant information. The Civil & Environmental Engineering curriculum committee works each year to improve the curriculum that we offer. Please be assured that we will always do our best to solve problems that might arise because of changes in the Environmental Engineering Undergraduate Handbook.

If you have any problems, concerns, or suggestions related to the Environmental Engineering Undergraduate Handbook or, more generally, with the undergraduate program in Environmental Engineering at Illinois, please feel free to bring them to my attention. Good luck with your studies!

Professor John Popovics
Associate Head & Director of Undergraduate Studies Department of Civil and Environmental Engineering

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Introduction

1.1 Environmental Engineering – An Overview

Environmental engineers address important issues facing society: ensuring clean air, safe drinking water and sanitation; evaluating opportunities and designing systems for sustainable environmental resource management; designing infrastructure and developing technologies to enable climate change mitigation and adaptation; protecting people from natural and man-made hazards; and designing sustainable infrastructure that benefits society. The CEE at Illinois curriculum ensures that students graduate with a deep understanding of environmental and water resources engineering fundamentals and are skilled in computational tools, big data, design strategies, and hands-on research.

The Environmental Engineering program comprises five focus areas: Energy and Environmental Sustainability; Climate and Environmental Sustainability; Water Systems and Sustainability; Public Health Engineering; and One Water. Although each area and program has its own special body of knowledge and engineering tools, environmental and water resources engineering projects often use knowledge and data from many of these topical areas together to address societal challenges.

Climate and Environmental Sustainability (CES): CES students will develop skills to quantify and manage the dynamic interactions among society and the built and natural environments, with an emphasis on environmental and water resources engineering to adapt to a changing global climate. Coursework will focus on atmospheric sciences (including physical climate and physical meteorology), natural resource economics, environmental systems analysis, decision and risk analysis, and data science to generate insight from large and complex datasets.

Energy and Environmental Sustainability (E2S): The E2S primary focuses on understanding, quantifying, and modeling the interdependencies between energy, water, and the environment. Students will gain fundamental and applied knowledge in thermodynamics and chemical principles, and expertise in water policy, renewable energy systems, and sustainable design.

One Water (OneW): The OneW primary centers on the safe and reliable provision of drinking water, sanitation, and stormwater management for communities and households. Students in this primary will learn physical, chemical, and biological principles and how to apply them to design and develop innovative water quality control processes and systems to efficiently deliver safe, renewable water resources to communities and ecosystems. Students will also learn how to design resource (water, nutrient, energy) recovery systems to support circular economics. *The term “One Water” stems from an international trend toward holistic water planning by municipalities (for example, “One Water LA” for the City of Los Angeles).

Public Health Engineering (PHE): Students in the PHE primary will gain skills in monitoring and modeling air pollution, air and water pollution control technologies, and physicochemical and

toxicological analysis of environmental contaminants. Students will also learn the skills to analyze and evaluate the interconnections between environmental factors and the progression of human diseases through various designs of epidemiological studies and apply the principles of engineering control for the protection of public health.

Water Systems and Sustainability (WS2): The WS2 primary focuses on understanding, designing, and managing natural and engineered water systems. Students learn foundational knowledge of environmental hydrology and hydraulic engineering and gain skills to develop sustainable solutions to urban water challenges such as flooding, to manage surface water and groundwater transport and pollution, and to design novel nature-based solutions and green and hybrid infrastructure to overcome the challenges imposed by a changing environment.

1.2 Environmental Engineering Program Educational Objectives

Educational objectives for the Environmental Engineering program reflect the mission of the Department of Civil and Environmental Engineering, the importance placed on successful professional practice, the ability to pursue advanced degrees, the assumption of professional and societal leadership roles, and a commitment to lifelong learning. U. of I. Environmental Engineering graduates will have the option, talents, and knowledge to pursue and achieve:

1) a wide range of careers as engineers, consultants, and entrepreneurs in both traditional and emerging fields of environmental engineering, science, and technology in diverse areas that include public health engineering, one water, energy and environmental sustainability, climate and environmental sustainability, and water systems and sustainability;

2) placement in leading graduate programs in environmental engineering and interdisciplinary areas so they can develop as researchers, experts, educators, and leaders;

3) professional licensure and continuous professional skills development;

4) the ability to learn and create new knowledge in ever-changing environments of the 21st century and to communicate their work and ideas to colleagues, professional societies, and the public at large; and

5) high ethical and technical standards that enable them to lead their professional disciplines, organizations, and communities globally.

The career paths available to environmental and water resources engineers are many and varied from conceptual design of facilities that do not yet exist to forensic study of facilities that have failed to perform as expected, from advanced simulation of complex systems to the management of people and projects, and from private consulting to public service. The Environmental Engineering curriculum is specifically designed to meet this educational challenge by emphasizing fundamental knowledge, transferable skills, and lifelong learning.

1.3 Department of Civil and Environmental Engineering

The Department of Civil and Environmental Engineering Department Head is Professor Jeremy Guest. Professor John Popovics and Professor Scott Olson are Associate Heads of the department in charge of undergraduate and graduate affairs.

Department of Civil and Environmental Engineering
Newmark Civil Engineering Laboratory (NCEL)
205 North Mathews Avenue
Urbana, Illinois 61801
http://cee.illinois.edu/

Department Head

Jeremy Guest	Department Head	1114 NCEL	244-9247	jsguest@illinois.edu
Vicki Dixon	Associate Director of Operations	1114 NCEL	244-0857	vdixon@illinois.edu
Mike Uhall	Sr. Program Coordinator	1113 NCEL	300-4431	uhall2@illinois.edu

Associate Head & Director of Undergraduate Studies

John Popovics	Assoc. Head & Director of Undergraduate Studies	1116 NCEL	244-0843	jonpop@illinois.edu
Becky Stillwell	Assoc. Director of Undergraduate Programs	1102 NCEL	333-3812	rborden@illinois.edu
Pascal Youakim	Academic Advisor	1111 NCEL	300-2414	youakim2@illlinois.edu
Greg Coughlin	Senior Undergraduate Program Coordinator	1117 NCEL	265-5539	gcoughli@illinois.edu

Associate Head & Director Graduate Programs

Scott Olson	Assoc. Head & Director of Graduate Studies	1110 NCEL	265-7584	olsons@illinois.edu
Brittany Meeker	Graduate Program Coordinator	1108 NCEL	265-0395	bmeeker@illinois.edu
Katya Trubitsyna	Asst. Director of Graduate Recruitment & External Relations	1104 NCEL	300-0194	katia@illinois.edu

1.4 Environmental Engineering Undergraduate Contacts

This section gives a summary of the responsibilities and expectations of each participant who advises or supports the undergraduate program in Environmental Engineering.

The Associate Head: The Associate Head & Director of Undergraduate Studies oversees the undergraduate program and is responsible for administering undergraduate advising policies. The Associate Head is responsible for supervising all personnel involved in the undergraduate program. The Associate Head is also the point of contact for grievances related to the classroom (course conduct and grading).

Professor John Popovics
1116 Newmark Civil Engineering Laboratory (217) 244-0843
johnpop@illinois.edu

The Associate Director of Undergraduate Programs: This position works directly with the CEE Associate Head & Director of Undergraduate Studies. The Associate Director of Undergraduate Programs advises students on navigating the Environmental Engineering undergraduate curriculum, campus, college, and department requirements for graduation. This position also monitors the academic progress of all students and works closely with students to establish study abroad credit and transfer credit. The Associate Director of Undergraduate Programs is responsible for supervising both the Academic Advisor and Undergraduate Program Coordinator positions.

Becky Stillwell
1102 Newmark Civil Engineering Laboratory (217) 333-3812
rborden@illinois.edu

The Academic Advisor: This position works directly with the CEE Associate Head & Director of Undergraduate Studies, and the Associate Director of Undergraduate Programs. Advises students on navigating the Environmental Engineering undergraduate curriculum, campus, college, and department requirements for graduation. The Academic Advisor monitors the academic progress of all students. This position works closely with students to establish study abroad and/or transfer credit and manages Academic Program Plans. The Academic Advisor oversees the department's scholarships and is the department's main contact.

Pascal Youakim
1111 Newmark Civil Engineering Laboratory (217) 300-2414
youakim2@illinois.edu

The Undergraduate Program Coordinator: is responsible for undergraduate student records, class scheduling, classroom reservations, textbook orders, final exams, FLEX forms, and supporting the Associate Director of Undergraduate Programs.

Gregory Coughlin
1117 Newmark Civil Engineering Laboratory, (217) 265-5539
gcoughli@illinois.edu

The Assistant Director of Alumni and Corporate Relations: is responsible for Fall and Spring job fairs, backpack-to-briefcase, professional development, alumni, and student events. This position works closely with the Civil and Environmental Engineering Alumni Association (CEEAA) board in making connections with students and the department.

Amy Whitaker
1210 Newmark Civil Engineering Laboratory, (217) 300-2341
amwhit@illinois.edu

The Faculty Advisor: Each environmental engineering student is assigned a faculty advisor from the Environmental Engineering and Science (EES) or Water Resources Engineering and Science (WRES) faculty groups. Students are informed who their assigned advisor is through annual email messages. Students can also look up their assigned advisor through the U of I Self Service system. Your faculty advisor can serve as a resource for learning how to improve your study habits and other life skills that are needed to excel in our program. The faculty advisor is also a good resource for discussing curricular and career decisions.

You should get to know your faculty advisor better and visit him/her/them two or three times a year. A good working relationship with your faculty advisor can help you succeed in our program. If you feel there is an advisor within your discipline who could be more beneficial to you, please reach out to the Academic Advisor about requesting a change.

1.5 Grainger College of Engineering

The Grainger College of Engineering offers advice for all engineering students, particularly for questions that are outside the domain of specific departments. Website: *https://grainger.illinois.edu/*

Undergraduate Programs Office (UPO)

4th Floor of Grainger Library	333-2280 http://engineering.illinois.edu/academics/undergraduate/
Jonathan Makela, Assoc. Dean	jmakela@illinois.edu
Ivan Favila, Sr. Asst. Dean	ifavila@illinois.edu
Kerri Green, Asst. Dean	kgreen0@illinois.edu
Emad Jassim, Asst. Dean	jassim@illinois.edu
Brian Woodard, Asst. Dean	bswoodrd@illinois.edu
Corey Flack, Asst. Director	flack3@illinois.edu
Trent Shumway, Asst. Director	tshumway@illinois.edu

Center for Academic Resources in Engineering (CARE)

Ivan Favila – Director
Dana Temple – Assoc. Director

4th Floor Grainger Engineering Library
217-244-2678
engr-care@illinois.edu
https://care.grainger.illinois.edu/

Engineering Career Services (ECS)

Leigh Deusinger - Director

3270 Digital Computer Lab
217-333-1960
ecs@engr.illinois.edu
https://ecs.engineering.illinois.edu/

International Programs in Engineering (IPENG)

Kate Abney - Director

3300 Digital Computer Lab
217-244-0054
ipeng@illinois.edu
https://students.grainger.illinois.edu/ipeng/home/

Grainger College of Engineering Undergraduate Program Office (UPO): The Office of Undergraduate Programs is located on the 4th Floor of Grainger Library. The Assistant Deans and advising staff are available for advising and academic matters. UPO maintains undergraduate student records in the Grainger College of Engineering and monitors student progress. They administer all academic issues that involve more than one department (e.g., inter-departmental transfers).

1.6 James Scholar Honors Program

James Scholar Honors is a college-level honors program that allows you extra academic experiences. James Scholars have priority registration for classes and have the option to take honors courses and receive a special distinction when they graduate.

First Year Students are invited to participate during their first semester. Students may apply through the James Scholar portal in the first 10 days of class each semester, after they have been on campus for one semester and if they meet the 3.50 GPA requirement; they are required to take one honors course per year. Class sections are designated with an "H" at the end of their section designation.

Honors Credit Learning Agreement (HCLA): This represents an agreement between you and the instructor regarding the additional work to be completed in a course to receive honors credit. This can be done for any course with instructor approval. You will receive honors credit for the course.

The upper-class James Scholar Program involves sophomores, juniors, and senior students who have achieved a minimum cumulative University of Illinois GPA of 3.50 and who are therefore eligible to apply to be an Engineering James Scholar. Applications are accepted during the first ten days of class in the fall and spring semesters. https://students.grainger.illinois.edu/jscholar/about/

1.7 Center for Academic Resources in Engineering (CARE)

The Center for Academic Resources in Engineering (CARE) creates a dynamic learning community where services, resources, and expertise converge to support engineering students as they work to realize their academic, professional, and personal aspirations.

At CARE, students find an engaging commons area designed to encourage interaction and collaboration. Scheduled and on-demand tutoring, study groups, teaching assistants, and a variety of resources are available to help students excel.

With 20,000 sq. ft of space spanning the entire fourth floor of the Grainger Engineering Library, CARE offers a variety of designated areas for group study, individual study, tutoring, computer workstations, course study halls, and workshops. Rooms can be reserved for study groups, tutoring, practicing presentations, workshops, videoconferencing, and other activities. https://care.grainger.illinois.edu/

1.8 Engineering Career Services

Engineering Career Services (ECS) assists students in developing the skills to transform their unique talents and interests into meaningful careers and professional pathways. ECS hosts career fairs, provides seminars, and arranges on-campus interviews to provide employment opportunities for students. For more information about ECS, please visit their website: http://ecs.engineering.illinois.edu/

1.9 International Programs in Engineering (IPENG)

The Grainger College of Engineering study abroad office. Our portfolio includes exchange programs, direct enroll programs, providers programs, customized short-term programs, and signature programs.

You can fit an international experience into your Engineering schedule. There is a wide array of opportunities from studying, interning, researching, or volunteering abroad to on-campus activities such pursuing an International Minor or participating in Global Engineering Ambassadors.

Being a global engineer is invaluable! Employers seek job applicants with international experience and intercultural skills. This experience can be a deciding factor in selecting new employees.

1.10 Academics

There are certain rules and regulations that may be especially important to your life at the University of Illinois. The Student Code documents these issues in detail.

Course Grade: Grades at the University of Illinois are based on the traditional four-point scale (i.e., A=4, B=3, C=2, D=1, F=0). An instructor may elect to distinguish a grade with a plus or a minus. A plus adds 0.333 to the basic grade value, and a minus subtracts 0.333 from the basic grade value (e.g., a B+ is worth 3.333 points and a C- is worth 1.667 points). The only exception is the A+, which is simply worth 4 points. The rules associated with the grading system at the University of Illinois are described in the Student Code in Sections 3-101 through 3-104.

If you retake a course – a very good idea for any technical course for which you earn a grade lower than C- (see Section 2.3 for advice on this matter) – the original grade also remains on your transcript, as if it were a different course, and both grades are included in calculating your GPA.

Credit/No Credit Option: The credit/no credit option is designed to encourage students to explore subjects that they might otherwise avoid. The rules concerning the credit/no credit option are described in the Student Code in Section 3-105. To briefly summarize those rules, note that (1) all required courses are taken for a grade, (2) all core and technical courses are taken for a grade, and (3) humanities and social

sciences are taken for a grade. Free electives can be used for a credit/no credit option. https://advising.grainger.illinois.edu/course-registration/credit-no-credit

Grade Replacement: All undergraduate students can repeat courses and use the new grade to replace the grade they earned in the first attempt. The policy places some limits on courses and hours that can be replaced. Undergraduates in the Grainger College of Engineering can use an online portal to request that a current course be used for grade replacement. For more information about this policy, please see the website below. https://advising.grainger.illinois.edu/course-registration/grade-replacement

Residency Requirements for a Degree: In addition to specific course and scholastic average requirements, each candidate for a bachelor's degree from the University of Illinois Urbana-Champaign (U. of I.) must earn at least 60 semester hours of U. of I. credit, of which at least 21 hours must be 300 or 400 level courses at U. of I.

Restrictions on Dropping Courses: Students may freely drop any "unrestricted" course up to mid-term as long as they remain full time with 12 or more credit hours.

Students who wish to drop a class after the campus deadline MUST have extenuating circumstances beyond their control that directly affected their academic performance – e.g., documented illness, personal emergency, or crisis. Requests of this nature must be well supported through documentation.

College Restricted Courses: CHEM 102/103, 104/105; CS 101, 124; MATH 220/221, 231, 241, 285; PHYS 211, 212, 213; RHET 105. A drop requires approval from a Dean in the Undergraduate Programs Office, 4th Floor of Grainger Library.

Civil and Environmental Engineering Restricted Courses: CEE 190, 201, 202, 331; TAM 211, 212, 251, 335. A drop requires approval from the Faculty Advisor of the student's home department and a Dean in the Undergraduate Programs Office, 4th Floor Grainger Library.

Academic Warning: Academic Warning (previously called probation) is when an improvement in academic performance or progress is required. This can include when the College GPA falls below a 2.25. This GPA is calculated from core engineering courses essential to success in an engineering curriculum. Historically, students with a low College GPA see multiple semesters of academic warning or are eventually dropped from the university.

If the academic warning GPA level assigned is not met in the following semester, the student is subject to drop rules. The minimum academic goal of any student should be to keep his/her/their GPA for any semester above 2.00.

Additional information can be found at https://advising.grainger.illinois.edu/academic-standing/academic-warning or you may contact Undergrad Advising at cee-ugadvising@illinois.edu for clarification.

Advice and Best Practices for Students on Academic Warning:

- Take no more than 16 hours and no more than 10 technical hours this semester.
- Take no more than 3 technical courses.
- Consider taking fewer technical classes if you have struggled with 3 technical courses in the past.
- In general, repeat any technical/engineering course for which you earned a C- or below. That includes Math, Phys, Chem, and core classes for major.
- Students who earned a D or below in calculus should consider taking the prior level course right away.
- Students should discuss with an academic advisor develop an appropriate plan.
- Make sure to check prerequisites for all courses and do not take courses concurrently with their prerequisites.

Academic Integrity: Infractions of academic integrity, such as cheating and plagiarism, are not tolerated at the University of Illinois. The rules that govern the academic integrity of all students are covered in Section 1-402 of the Student Code: https://studentcode.illinois.edu/article1/part4/1-402/

1.11 Registered Student Organizations (RSO's)

The Department of Civil and Environmental Engineering provides an excellent opportunity to supplement classroom education through contact with other students, faculty, and practicing engineers. Student organizations bring in speakers from various engineering fields, sponsor field trips to construction and manufacturing sites, and coordinate Engineering Open House. All student groups hold regular meetings, most of which are open to non-members. The student groups have websites that give information about the officers, requirements for joining, lists of activities, and other information. To contact these organizations, please visit their website: https://cee.illinois.edu/student-life/student-organizations

Registered Student Organizations - Department of Civil and Environmental Engineering

ACI	American Concrete Institute
AREMA	American Railway Engineering and Maintenance-of-Way Assoc.
ASCE	American Society of Civil Engineers
CCT	Concrete Canoe Team
EERI	Earthquake Engineering Research Institute
EIA	Engineers in Action Bridge Program

EMBRACE	Empowering Minorities and Building Representation Across Civil and Environmental Engineering
GESO	Geotechnical Engineering Student Organization
IAHR	International Association for Hydraulic Research
ISD	Illinois Solar Decathlon
ITE	Institute of Transportation Engineers
IWRA	International Water Resources Association
SBT	Steel Bridge Team
SS	Sustainable Solutions
SSE	Students for Environmental Engineering
XE	Chi Epsilon - Civil Engineering Honor Society
WCEE	Women in CEE

Registered Student Organizations - Grainger College of Engineering

EC	Engineering Council
EWB	Engineers Without Borders
NSBE	National Society of Black Engineers
SHPE	Society of Hispanic Professional Engineers
SWE	Society of Women Engineers
TBP	Tau Beta Pi - Engineering Honor Society

Registered Student Organizations - Across Campus

AG	*ActGreen*
AAAR	American Association for Aerosol Research at UIUC
ISC	Illini Solar Car
IWCC	Illini Wildlife and Conservation Club
IBI	Illinois Biodiesel Initiative
SAS	Student Affairs Sustainability
SSLC	Student Sustainability Leadership Council
SEC	Students for Environmental Concerns

1.12 Job Fairs, Internships, and Study Abroad

There are excellent opportunities available to students for providing practical experience away from campus. Among these are the cooperative education program, internships, and the study abroad program.

Job Fairs: The Department of Civil and Environmental Engineering offers a Job Fair in September and February. The September event is a two-day fair with over 100 Civil and Environmental Engineering companies and recruiters available to speak to students about internships and full-time positions. This event is unique to our department and is different from others job fairs in the fact that it caters to our students in CEE, and not all engineering students, like the Engineering Career Services (ECS) fair does. They too offer fairs in September and February. For more information about the CEE event please see this website: https://cee.illinois.edu/student-life/career-prep/job-fair-cee-students

Internships: Summer internships are highly recommended. Most civil engineering students will have more than one internship experience before graduation. The summers are excellent opportunities to gain two or three months of hands-on experience. The practical experience and opportunity to get to know professional engineers can be key factors in your search for a permanent position after graduation.

Academic credit is not given for work experience. Summer internships are often obtained through the CEE job fairs and/or other networking activities.

Study Abroad: Study abroad is the pursuit of educational opportunities and activities in an international setting. These come in many different shapes and sizes, as they vary in academic objectives, length, location, and price. Studying abroad can truly be a life-changing experience. Studying abroad prepares students in many ways for today's global world by adding value to their education, allowing them to earn academic credit abroad, enhancing employability, improving intercultural competence, heightening intercultural communication skills, and giving students access to new information, technologies, and skills. Most students find it best to schedule study abroad during their sophomore or junior year.

The Associate Director of Undergraduate Programs can work with you to establish a program of study. You must gather all the relevant information from the institution you will be attending abroad and then meet with the Associate Director of Undergraduate Programs or the Academic Advisor before you leave. It is very important to have all your courses well documented (i.e., with a course syllabus and other information).

1.13 Graduation Honors

Honors awarded at graduation are designated as Honors, High Honors, and Highest Honors. The designation of Honors is awarded automatically to a student who has a cumulative U. of I. grade-point-average (GPA) of at least 3.5 at graduation. The designation of High Honors is automatically awarded to a student with at least a 3.8 GPA. To qualify for Highest Honors, a student must not only meet the GPA requirement for High Honors but also must have demonstrated outstanding performance in supplementary activities of an academic, professional, and/or extracurricular nature.

1.14 Financial Aid and Scholarships

Financial aid for undergraduate students is available from many sources. Coordination of the allocation of these funds is, in general, the responsibility of the Office of Student Financial Aid (in the Student Services Arcade Building, 620 E. John, 333-0100).

Civil and Environmental Engineering Scholarships and Awards: The Department of Civil and Environmental Engineering offers numerous awards and scholarships annually. These scholarships are established through the generous donations of alumni, private individuals, and industry sources. One application is used for all CEE awards and scholarships. An online application is available to students in December. The deadline for submitting applications is in January, following winter break.

Grainger Engineering Scholarships and Awards: In addition to the sources of financial aid that are available to all university students, undergraduate students in civil and environmental engineering may be eligible for scholarships that are administered by the Grainger College of Engineering.

1.15 Undergraduate Research

CEE Research Experiences for Undergraduates are paid positions that give you the opportunity to actively participate in research and work with faculty, graduate students and other researchers on ongoing projects. REUs develop not just your research skills, but also your interpersonal skills.

1. The program will be announced within two weeks of the start of a semester (Fall, Spring, and Summer II). Requests for proposals will be sent, and posted on the Undergraduate Blog, to faculty and undergraduate students with exact deadlines and requirements.
2. Talk to a faculty member in your area of interest to find out if they are available to partner on an REU, then work with them on a one/two-page proposal. Proposals can only be submitted by CEE faculty members on behalf of their students.
3. The length of employment will be 12 weeks (10 hrs per week) in the Fall and Spring semesters and 6 weeks (20 hrs per week) in the Summer at the hourly rate of $12.50 per hour. The total amount an undergraduate student will receive is $1,500 per student per semester of employment.
4. Each faculty member is limited to two students per year and students are eligible for two REUs during their undergraduate studies. In some cases, an undergraduate provides such value to the faculty's research that they are funded for ongoing work.

1.16 FE Exam

Fundamentals of Engineering (FE) and Fundamentals of Surveying (FS) exams have transitioned to computer-based testing and are now administered exclusively at approved Pearson VUE test centers.

Computer-based testing provides many advantages. Examinees are now able to schedule their exam at a time and location that works best for them and then receive their results within 7 to 10 days. Please visit http://ncees.org/exams/ to register for the exam. Students completing the BS EnvE degree should register for the FE Environmental exam.

1.17 Graduate Study

Nearly half of the students who graduate from civil and environmental engineering here at U of . go on to pursue graduate study. While a B.S. degree in Environmental Engineering provides a solid educational foundation for many career options, employers place high value on the M.S. degree. In certain disciplines, an M.S. degree is required for some entry-level positions. Graduate programs, admission requirements, and financial aid programs for graduate students vary significantly among universities. Detailed information about graduate programs for the department is available here: https://cee.illinois.edu/admissions/graduate

Graduate Study at U. of I.: One of the most direct routes to a graduate program is simply to continue your studies at U. of I. Students who are within 5 semester hours of completing the B.S. degree requirements may apply for early admission to the Graduate College and, if admitted, can complete their B.S. degree while enrolled as a graduate student.

Environmental Engineering undergraduates in their final year of study at U. of I. may use the Simple Entry Program to apply to a CEE or EE master's degree (non-Thesis) program. These students are not required to take the GRE or submit references to apply.

1.18 Graduate Study Simple Entry Program - Requirements

- Minimum 3.5 GPA, cumulative for all U. of I. courses, if applying to Structural Engineering.
- Minimum total cumulative GPA of 3.0 at U. of I. and a Minimum 3.3 GPA, calculated beginning with junior year (3rd year) forward if applying to all other areas.
- Students must enter M.S. program within a year following their graduation of their undergraduate program. If one year or more has passed since the student has graduated, the student will need to apply using the standard application process.
- You may confirm eligibility if needed by emailing the CEE Graduate Admissions Office.

How To Apply

1. Create an account and begin your online application *https://grad.illinois.edu/admissions/apply*.
2. In the field for "Other Specializations, enter "Simple Entry".
3. Leave the GRE and reference sections blank. If you need to enter a name to continue to the next page, use your own name.
4. Upload a copy of your Academic History from your student account after Fall grades are posted if applying for next fall or after Spring grades are posted if applying to the Spring term.
5. Upload your personal statement, resume, passport (if international), and funding documentation (if international).
6. Email the CEE Graduate admissions office at katia@illinois.edu to let us know your application has been submitted. We will then begin your application review.

Students choosing to apply by "Simple Entry" should be interested in the non-thesis track for their M.S. program. The non-thesis track may facilitate completion of the MS degree within as little as a 12-month period. It is important to realize that most graduate scholarship/fellowship programs and research opportunities at Illinois require GRE scores and letters of recommendation. For many students who are not interested in research and able to fund their own M.S. program, the simple entry is an attractive option. https://cee.illinois.edu/admissions/graduate/simple-entry-program-cee-undergraduates

GRE test scores are currently optional for all CEE graduate school applicants. However, it is strongly recommended that the GRE test be submitted to help faculty with admission and funding decisions for all PhD applicants. CEE also recommends the GRE test for MS applications, particularly for students applying from international universities, MS applicants looking for potential funding support, or MS applicants whose GPA falls below the average GPA of admitted students.

GRE test scores are currently optional for all CEE graduate school applicants. However, it is strongly recommended that the GRE test be submitted to help faculty with admission and funding decisions for all PhD applicants. CEE also recommends the GRE test for MS applications, particularly for students applying from international universities, MS applicants looking for potential funding support, or MS applicants whose GPA falls below the average GPA of admitted students.

GRE General Test - averages for CEE applicants approved for admission:

- Verbal: 155
- Quantitative: 165
- Analytical Writing: 4.0

Information about test dates and locations can be found on the GRE website https://www.ets.org/gre.html. The GRE is administered by the Educational Testing Service.

Please plan so that your official GRE scores will arrive to U. of I. by your application deadline. Applicants should request that the Educational Testing Service send GRE scores to the U. of I. using our institution code number 1836.

2
Curriculum

2.1 Overview of the Curriculum

The curriculum leading to the degree of Bachelor of Science in Environmental Engineering requires 128 hours. A summary of the program follows.

2.1.1. Required Courses

The following courses, associated with 67 semester hours of academic credit, are required in the undergraduate curriculum in environmental engineering. These courses provide the foundation for the study of civil engineering.

Orientation and professional development (8 hours)

- CEE 190 Project-Based Introduction to CEE – 4hrs
- CEE 495 Professional Practice – 0hrs
- ENG 100 Grainger Engineering Orientation Seminar (First-Year Students) – 1hrs **OR**
- ENG 300 Grainger Engineering Orientation Seminar (For External Transfers) – 1hrs
- CEE 340 – Energy and Global Environment or ECE 316 – Ethics and Engineering – 3hrs

Foundational Mathematics and Science (32 hours)

- ATMS 202 General Physical Climate – 3hrs
- CHEM 102 General Chemistry I – 3hrs
- CHEM 103 General Chemistry Lab I (to be taken with CHEM 102) – 1hrs
- CHEM 104 General Chemistry II – 3hrs
- CHEM 105 General Chemistry Lab II (to be taken with CHEM 104) – 1hrs
- MATH 221 Calculus I – 4hrs (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)
- MATH 231 Calculus II – 3hrs
- MATH 241 Calculus III – 4hrs
- MATH 257 Linear Algebra with Computational Applications – 3hrs **
- MATH 285 Intro Differential Equations – 3hrs
- PHYS 211 Univ Physics, Mechanics – 4hrs

**MATH 415 Linear Algebra (3 hrs) can be substituted

Environmental Engineering Technical Core (35 hours)

- CEE 201 Systems Engrg & Economics – 3hrs
- CEE 202 Engineering Risk & Uncertainty – 3hrs
- CEE 330 Environmental Engineering – 3hrs
- CEE 331 Fluid Dynamics in the Natural and Built Environment – 4hrs **
- CEE 350 Water Resources Engineering – 3hrs

- CEE 449 Environmental Engineering Lab – 3hrs
- CEE 453 Urban Hydrology and Hydraulics – 4hrs
- CS 101 Intro to Computing, Eng & Sci – 3hrs[***]
- SE 101 Engineering Graphics and Design – 3hrs
- TAM 211 Statics – 3hrs
- TAM 212 Introductory Dynamics – 3hrs

[**]TAM 335 Fluid Dynamics (4 hrs) can be substituted

[***]CS 124 Introduction to Computer Science I (3 hrs) can be substituted

Dynamic Course Maps

2.2 Primary Fields (students choose one of five (5) Primary Fields)

The curriculum sequence maps available at the QR code link are examples only. All Grainger Engineering students work closely with a departmental academic advisor to develop an individualized academic plan that aligns with their educational goals, prior preparation, and specific needs.

Climate & Environmental Sustainability Primary Field (31 Hours)

- ACE 310 Natural Resource Economics 3 hrs
- ATMS 201 General Physical Meteorology 3 hrs
- CEE 340 Energy and Global Environment 3 hrs
- CEE 434 Environmental Systems, I 3 hrs
- CEE 458 Water Resources Field Methods 4 hrs
- CEE 491 Decision and Risk Analysis 3 hrs
- CEE 492 Data Science for Civil and Environmental Engineering 3 hrs
- ECON 102 Microeconomics
  - or ACE 100 Introduction to Applied Microeconomics 3 hrs
- GGIS 379 Introduction to Geographic Information Systems 4 hrs
- PHYS 213 Univ. Physics: Thermal Physics 2 hrs

Energy & Environmental Sustainability Primary Field (30 Hours)

- ABE 436 Renewable Energy Systems 4 hrs
- CEE 340 Energy and Global Environment 3 hrs
- CEE 433 Water Technology and Policy 3 hrs
- CEE 493 Sustainable Design Eng Tech 4 hrs
- CHEM 232 Elementary Organic Chemistry I 3 hrs
- CHEM 360 Chemistry of the Environment 3 hrs
- ENSU 301 Soc Impacts Weather and Climate 3 hrs
- ME 200 Thermodynamics 3 hrs
- PHYS 212 University Physics: Elec & Mag 4 hrs

One Water Primary Field (29-30 Hours)

- CEE 437 Water Quality Engineering 3 hrs
- CEE 440 Fate Cleanup Environ Pollutant 3 or 4 hrs
  - or CEE 452 Hydraulic Analysis and Design
- CEE 442 Env Eng Principles, Physical 4 hrs
- CEE 444 Env Eng Principles, Biological 4 hrs
- CHBE 221 Principles of CHE 3 hrs
- CHBE 321 Thermodynamics 4 hrs
- CHEM 232 Elementary Organic Chemistry I 3 hrs
- CHEM 360 Chemistry of the Environment 3 hrs
- PHYS 213 Univ. Physics: Thermal Physics 2 hrs

Public Health Engineering Primary Field (30 Hours)

- ATMS 305 Computing and Data Analysis 3 hrs
- CEE 435 Public Health Engineering 3 hrs
- CEE 437 Water Quality Engineering 3 hrs
- CEE 438 Science and Environmental Policy 3 hrs
- CEE 441 Air Pollution Sources, Transport and Control 4 hrs
- HK 201 Health Sciences Research Methods 3 hrs
- HK 207 Introduction to Epidemiology 3 hrs
- HK 408 Environmental Health 4 hrs
- MCB 300 Microbiology 3 hrs
- PHYS 213 Univ. Physics: Thermal Physics 2 hrs

Water Systems & Sustainability Primary Field (32 Hours)

- ACE 310 Natural Resource Economics 3 hrs
- ATMS 201 General Physical Meteorology 3 hrs
- CEE 433 Water Technology and Policy 3 hrs
- CEE 434 Environmental Systems, I 3 hrs
- CEE 450 Surface Hydrology
  - or CEE 457 Groundwater 3 hrs
- CEE 451 Environmental Fluid Mechanics 3 hrs
- CHEM 232 Elementary Organic Chemistry I 3 hrs
- CHEM 360 Chemistry of the Environment 3 hrs
- ECON 102 Microeconomics
  - or ACE 100 Introduction to Applied Microeconomics 3 hrs
- ENSU 301 Soc Impacts Weather and Climate 3 hrs
- PHYS 213 Univ. Physics: Thermal Physics 2 hrs

2.3 General Education Requirements (12 hours)

The University of Illinois Urbana-Champaign requires that all undergraduate students take General Education - or "Gen Ed" - courses to gain and use broad knowledge beyond the specialized learning they will do in a major field of study. These Gen Ed requirements cover the kinds of knowledge all students should have: the humanities and arts, social and behavioral sciences, natural sciences and technology, quantitative reasoning, composition/writing, and cultural studies.

For students enrolled in Academic Catalog years 2022-2023 and beyond
The Grainger College of Engineering requirements for the General Education requirements are 12 hours, consisting of the following:

1. 6 hours of campus GenEd courses in Humanities & the Arts. *
2. 6 hours of campus GenEd courses in Social & Behavioral Sciences. *

The Advanced Composition requirement: The Advanced Composition requirement provides an intensive writing course whose goals are (1) to improve understanding of critical issues within a substantive discipline and (2) to improve mastery of technical aspects of writing. This requirement is satisfied by CEE 340 – Energy and the Global Environment.

2.4 Free Electives

Undergraduate students in the Grainger College of Engineering have 10 (ten) or more semester hours of free electives; the exact number required depends on the major.* Almost any course offered by the University, and most transfer courses, can be used for free electives in accordance with the guidelines established by the Grainger College of Engineering to reach the total of 128 hours required for a B.S. in Environmental Engineering. https://advising.grainger.illinois.edu/degree-requirements/free-electives

*Undergraduate students in the Grainger College of Engineering enrolled in Academic Catalog years prior to 2022-2023 have 6 (six) or more semester hours of free electives; the exact number depends on the major.

2.5 Prerequisites

The study of engineering is a process of building fundamental knowledge. Hence, the prerequisite structure of the courses is extremely important. Prerequisites, as listed in the course catalog, are meant to be a guide to what you are expected to know when you start a certain course. Your success in any course depends strongly upon your mastery of the prerequisite material. For quick reference, the prerequisites are shown in the curriculum maps available online at
https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/env-eng-map

2.6 Independent study and special topics courses

A student may take an independent study (i.e., CEE 497) or a special topics course (i.e., CEE 498) in partial fulfillment of the degree requirements. Such a course can count as a technical elective in the primary or secondary field and is subject to the program review process. There are many good reasons to include such courses in your curriculum. An independent study is a self-paced study of a particular topic, carried out under the guidance of a faculty member. Each faculty member has his/her/their own section

number. An independent study must be taken for a grade if it is to be used toward graduation requirements as a technical elective. Independent study provides an opportunity to include research in your undergraduate program. The form can be obtained from Becky Stillwell.

Special topics course (CEE 498): Special topic courses provide a mechanism to easily introduce new classes into the curriculum. These courses are designated as "experimental courses" because they have not been through the required review process of permanent courses on campus.

2.7 Data Science Certificate

CEE undergraduates can earn a CEE-focused Certificate in Data Science and Computing by taking a series of four courses that focus on data handling and processing, data analysis, including machine learning, computing; and data presentation. All are presented within the context of the CEE sub-disciplines.

Appendix A. Integrated Design Courses

An integrated design course is a course that has a design project that makes up a significant component of the course requirements. The following courses meet the conditions of an integrated design course. The integrated design project provides engineering design experience based on knowledge and skills acquired earlier. The design experience incorporates engineering standards and realistic engineering constraints to create a solution that generally includes economic, social, and political concerns.

- CEE 449 Environmental Engineering Lab
- CEE 453 Urban Hydrology and Hydraulics
- CEE 493 Sustainable Design Eng Tech

Appendix B. Environmental Engineering Laboratory Course

A laboratory course is a course that has hands-on experimental or evaluative activity, such as data analysis, that makes up a significant component of the course requirements. The following courses meet the conditions of a laboratory course.

- CEE 449 Environmental Engineering Lab
- CEE 458 Water Resources Field Methods

3

Typical Eight-Semester Schedule

3.1 Representative Schedule

There is some flexibility implicit in the sequencing of the courses you must take to complete the undergraduate curriculum in Environmental Engineering. The order of your courses will be affected by advanced placement, transfer courses, prerequisite courses, and course availability.

First Year	Hour	First Semester (17 hours)
	4	CEE 190—Project-Based Introduction to CEE[1]
	1	ENG 100—Engineering Lecture
	4	MATH 221—Calculus I[3]
	3	CHEM 102—General Chemistry I
	1	CHEM 103—General Chemistry Lab I
	4	RHET 105—Principles of Composition[2]
		(OR SE 101 – Engineering Graphics and Design)

	Hours	Second Semester (17 hours)
	3	CS 101—Intro Computing: Engrg & Science
	4	PHYS 211—Univ Physics, Mechanics
	3	MATH 231—Calculus II
	3	CHEM 104—General Chemistry II
	1	CHEM 105—General Chemistry Lab II
	3	SE 101—Engineering Graphics & Design[2]
		(OR RHET 105 – Principles of Composition.)

Second Year	Hours	First Semester (16 hours)
	3	CEE 201—Systems Engrg & Economics
	3	ATMS 202 – General Physical Climate
	4	MATH 241—Calculus III
	3	MATH 257—Linear Algebra w/Comp Appls
	3	General Education Elective

	Hours	Second Semester (15 hours)
	3	CEE 202—Engineering Risk & Uncertainty
	3	TAM 211 – Statics
	3	Primary field course
	2	Primary field course
	4	General Education Elective (Econ 102/103)
		Language Other Than English (3rd Level Course)

Third Year	Hours	First Semester (16 hours)
	4	CEE 331
	3	TAM 212
	3	CEE 330
	3	Primary field course
	3	Primary field course

	Hours	Second Semester (15 hours)
	3	MATH 285
	3	CEE 340 (Advanced Composition)
	3	CEE 350
	3	Primary field course
	3	General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)

Fourth Year	Hours	First Semester (16 hours)
	0	CEE 495
	3	Primary field course
	3	Primary field course
	3	Primary field course
	4	Primary field course
	3	General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)

	Hours	Second Semester (16 hours)
	3	CEE 449
	4	CEE 453
	3	Primary field course
	3	Free elective course
	3	Free elective course

4
Environmental Engineering Courses

4.1 Catalog Descriptions

This section of the handbook contains the course descriptions for 100, 200, 300, and 400 level courses taught through the Civil and Environmental Engineering department. The courses are listed in numerical order. The rubric CEE is implied. Each entry has a brief description of the prerequisites, and the number of hours of credit for the course. These entries should correspond exactly to the U. of I. Course Catalog.

190. Project-Based Introduction to CEE. Allows freshmen to explore topics in Civil and Environmental Engineering through a project-based learning format. The course also develops competencies in critical skills such as technical writing in CEE, data management and computation, and design thinking in a collaborative team environment. 4 hours.

201. Systems Engrg & Economics. Introduction to the formulation and solution of civil engineering problems. Major topics are engineering economy, mathematical modeling, and optimization. Techniques, including classical optimization, linear and nonlinear programming, network theory, critical path methods, simulation, decision theory, and dynamic programming are applied to a variety of civil engineering problems Prerequisite: MATH 231; CS 101; credit or concurrent registration in MATH 257 or MATH 415. 3 hours.

202. Engineering Risk & Uncertainty. Identification and modeling of non-deterministic problems in civil engineering design and decision making. Development of stochastic concepts and simulation models and their relevance to real design and decision problems in various areas of civil engineering. Prerequisite's CS 101, Credit or concurrent registration in MATH 241.

330. Environmental Engineering. Considers the sources, characteristics, transport, and effects of air and water contaminants; biological, chemical, and physical processes in water; atmospheric structure and composition; unit operations for air and water quality control; solid waste management; and environmental quality standards. Prerequisite: CHEM 104 or CHEM 204. 3 hours.

331. Fluid Dynamics in the Natural and Built Environment. Fundamentals of fluid motion and transport processes in the natural, managed, and built environment. Focus on physical understanding of the behavior of fluids for applications in natural and engineering challenges. Hydrostatics, dimensional analysis, equations of incompressible fluid motion, open channel flow, flow in porous media, groundwater, pipe flow, boundary layers, drag and lift, turbulence, fluids and energy, are covered within a global context to emphasize the role of fluid dynamics on the environment within the framework of the hydrologic cycle in nature and in the built environment. Credit is not given for CEE 331 and either TAM 335 or ME 310. Prerequisite: TAM 211. Credit or concurrent registration in TAM 212.

340. Energy and Global Environment. Introduction to evaluating multiple impacts of engineering decisions. Topics include mass and chemical balances; effects of engineered systems on local and global environment, health, and risk; economic, consumer, and social considerations; provision of conventional and renewable energy; and future projections. Design projects emphasize making appropriate decisions by quantifying total impact and evaluating social environment. Prerequisite: Completion of Composition I; PHYS 211; PHYS 213; CEE 201 or IE 310; CEE 202, IE 300, or STAT 200; or permission of instructor. 3 hours.

350. Water Resources Engineering. Quantitative aspects of water in the earth's environment and its engineering implications, including design and analysis of systems directly concerned with use and control of water; quantitative introduction to hydrology, hydraulic engineering, and water resources planning. Prerequisite: CEE 202; credit or concurrent registration in CEE 201. 3 hours.

433. Water Technology and Policy. This course will cover technical and social concepts of water and wastewater treatment; water resources; water law, policy, and economics; and water in integrated systems. Emphasis will be on the intersection between engineering and policy. Communication is an important element of this course: engineers will learn to "speak" policy via writing assignments, multimedia presentation, and briefings. Course activities include lectures, discussion, presentations, and field trips Prerequisite: CEE 340 or CEE 350. 3 hours

434. Environmental Systems, I. Introduction to the concepts and applications of environmental systems analysis. Application of mathematical programming and modeling to the design, planning and management of engineered environmental systems, regional environmental systems, and environmental policy. Economic analysis, including benefit-cost analysis and management strategies. Concepts of tradeoff, non- inferior sets, single and multi-objective optimization. Practical application to case studies to convey an understanding of the complexity and data collection challenges of actual design practice. Prerequisite: CEE 201 and CEE 330. 3 hours

435. Public Health Engineering. Aimed at building a next generation of engineers who are able to incorporate the principles of public health in all engineering designs. The course starts with the basic principles of epidemiology (types, methods, models and limitations). Next, the course covers various modes of environmental toxicity and the models to represent these modes. The course then covers infectious diseases, various models to represent their spread, the effect of environmental factors and the role of public health in breaking the chain of infection. The course also discusses environmental, social and behavioral factors in public health (e.g. environmental tobacco smoke including E-vaping) in the prevalence of chronic diseases. Finally, we cover the topics on public health risk assessment and management. In every aspect of the topic, the role of engineering in solving the problems of public health is explored and emphasized. 3 undergraduate hours. 4 graduate hours. Prerequisite: CEE 330.

437. Water Quality Engineering. Fundamental theory underlying the unit processes utilized in the treatment of water for domestic and industrial usage, and in the treatment of domestic and industrial wastewaters. Prerequisite: CEE 330; credit or concurrent registration in CEE 331 or TAM 335. 3 hours.

438. Science and Environmental Policy. Environmental treaties, the role of science and scientists in managing the national and global environment, effective science communication, scientific assessments, and the use of quantitative tools to inform policy decisions. Prerequisite: CEE 202 or IE 300 or STAT 400, or equivalent introductory probability and statistics course. Senior and Graduate students. 3 hours.

440. Fate Cleanup Environ Pollutant. Investigation of the regulatory and technical issues affecting solid and hazardous waste management, with an emphasis on the principles governing the transport, fate, and remediation of solid and hazardous waste in the subsurface, including advection, dispersion, sorption, interphase mass transfer, and transformation reactions. Prerequisite: CEE 330. 4 hours.

441. Air Pollution Sources, Transport and Control. A design approach to air pollution fate and control for the protection of human health and welfare. Air pollution transport and deposition. Gaussian plume, chemical mass balance models. Gaseous and particulate air pollutant physical and chemical properties and control. Evaluation of air pollutant emission control strategies based on cost and regulatory requirements for compliance with regulatory ambient air quality standards. 4 undergraduate hours. 4 graduate hours. Prerequisite: CEE 331 or equivalent; CEE 202 or equivalent. Credit or concurrent enrollment in ATMS 302 or equivalent.

442. Env Eng Principles, Physical. Analysis of the physical principles which form the basis of many water and air quality-control operations; sedimentation, filtration, inertial separations, flocculation, mixing and principles of reactor design. Prerequisite: CEE 437. 4 hours.

443. Env Eng Principles, Chemical. Application of principles of chemical equilibrium and chemical kinetics to air and water quality. Chemistry topics are thermodynamics, kinetics, acid/base chemistry, complexation, precipitation, dissolution, and oxidation/reduction. Many applications are also presented. Prerequisite: CEE 330. 4 hours.

444. Env Eng Principles, Biological. Application of principles of biochemistry and microbiology to air and water quality, wastes, and their engineering management; biological mediated changes in water and in domestic and industrial wastewater. Prerequisite: CEE 443. 3 hours.

447. Atmospheric Chemistry. The course will present current knowledge of the biochemical cycles of atmospheric trace gases, their interactions on global and regional scales, and their significance for chemistry in the atmosphere. The important fundamental concepts that are central to understanding air pollutants, e.g., the formation of aerosols and the transformation and removal of species in the atmosphere, will be introduced. Same as ATMS 420. Prerequisite: CHEM 104; either CEE 330 or ATMS 401. 3 hours.

449. Environmental Engineering Lab. A Combination of lecture and laboratory designed to provide exposure to the use of traditional analysis tools and techniques in analysis, control, and design of natural and engineered environmental systems including air, water, wastewater, solid and hazardous waste, and ecological systems. Prerequisite: CEE 330. 3 hours.

450. Surface Hydrology. Study of descriptive and quantitative hydrology dealing with the distribution, circulation, and storage of water on the earth's surface; discusses principles of hydrologic processes and presents methods of analysis and their applications to engineering and environmental problems. Prerequisite: CEE 350. 3 hours.

451. Environmental Fluid Mechanics. Incompressible fluid mechanics with particular emphasis on topics in analysis and applications in civil engineering areas; primary topics include principles of continuity, momentum and energy, kinematics of flow and stream functions, potential flow, laminar motion, turbulence, and boundary-layer theory. Prerequisite: CEE 331 or TAM 335. 3 hours.

452. Hydraulic Analysis and Design. Hydraulic analysis and design of engineering systems: closed conduits and pipe networks; hydraulic structures, including spillways, stilling basins, and embankment seepage; selection and installation of hydraulic machinery. Prerequisite: CEE 331 or TAM 335. 3 hours.

453. Urban Hydrology and Hydraulics. Hydraulic analysis and design of urban, highway, airport, and small rural watershed drainage problems; discussion of overland and drainage channel flows; hydraulics of storm-drain systems and culverts; determination of design flow; runoff for highways, airports, and urban areas; design of drainage gutters, channels, sewer networks, and culverts. Prerequisite: CEE 350. 4 hours. (Same as CEE 415)

457. Groundwater. Physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, role of groundwater in the hydrologic cycle, groundwater quality and contamination. Prerequisite: CEE 350 and CEE 331 or TAM 335, or consent of instructor. 3 hours.

458. Water Resources Field Methods. Scientific principles of measurement technologies and protocols used for water-resources measurements and experimental design of field-scale water-resources and environmental studies. Planning field studies; instruments and protocols for surface-water, groundwater, and water-quality sampling; description of data quality. One-half-day laboratory field trips to streamflow monitoring stations and groundwater monitoring wells nearby. Prerequisite: CEE 350. 4 hours

459. Ecohydraulics. Interactions between hydraulic, ecological, and geomorphic processes in river environments at a wide range of both spatial and temporal scales. Draws upon and synthetize fundamental concepts from biology, ecology, fluid mechanics and morphodynamics, to apply them to truly interdisciplinary problems. Such an approach, coupled with hands-on experience involving planning, conducting, and analyzing hands-on experiments at the Ven Te Chow Hydrosystems Laboratory and field surveys on local natural waters will provide the students with a broad perspective on the interconnections between physical and ecological systems. Students will apply their knowledge of fundamental processes to assess complex problems involving monitoring, management, conservation, and restoration of ecosystems. 4 undergraduate hours. 4 graduate hours.

490. Computer Methods. Computer methods and their programming for solving common types of differential equations arising in civil and environmental engineering (hyperbolic, parabolic, and elliptic

equations, with emphasis on prototypical cases, such as the convection-diffusion equation, as well as Laplace's / Poisson's equation). Exposure to state-of-the-art open-source numerical methods libraries. The course enables students in civil and environmental engineering to develop high-performance and high-purpose codes in these open-source frameworks for their research problems in an efficient way. 3 undergraduate hours. 4 graduate hours. Prerequisite: CEE 360 and CEE 331 or TAM 335.

491. Decision and Risk Analysis. Development of modern statistical decision theory and risk analysis, and application of these concepts in civil engineering design and decision making; Bayesian statistical decision theory, decision tree, utility concepts, and multi-objective decision problems; modeling and analysis of uncertainties, practical risk evaluation, and formulation of risk-based design criteria, risk benefit trade-offs, and optimal decisions. Prerequisite: CEE 202. 3 hours.

492. Data Science for Civil and Environmental Engineering. Students will learn to leverage data to study civil and environmental engineering problems, identify patterns, and make actionable insights. This course includes training in computational thinking and exploratory data analysis; data processing techniques including singular value decomposition, principal component analysis, and Fourier and wavelet transforms; and machine learning techniques including k-means, classification trees, neural networks, and neural differential equations. Students are required to bring a laptop computer to class. 3 undergraduate hours. 4 graduate hours. Prerequisite: CS 101; CEE 202; and CEE 300, CEE 330, or CEE 360.

493. Sustainable Design Eng Tech. Quantitative sustainable design (QSD) and how to navigate engineering decision-making. Economic (life cycle costing, techno-economic assessment) and environmental (life cycle assessment, LCA) sustainability assessments, and how to link these tools to design decisions under uncertainty. Design of engineered technologies individually and in teams, with special attention to water infrastructure and bioenergy production. Semester-long design project that includes components from two of the following three CEE sub-disciplines: environmental, hydraulic, geotechnical. Prerequisite: CEE 340. 4 hours.

495. Professional Practice. Series of lectures by outstanding authorities on the practice of civil engineering and its relations to economics, sociology, and other fields of human endeavor. 0 undergraduate hours. Prerequisite: Junior standing. 0 hours.

497. Independent Study. Individual investigations or studies of any phase of civil engineering selected by the student and approved by the department. Prerequisite: Senior or graduate standing; Consent of instructor. 1 to 16 hours.

498. Special Topics. Structured presentations of new and developing areas of knowledge in civil engineering offered by the faculty to augment the formal courses available. 1 to 4 hours.

4.2 Semester Course Offerings

CEE and other required courses are available in the semesters shown in the table below. This information is for planning purposes and is subject to change. Students should always refer to the university class schedule for reliable information when registering for upcoming semesters.

COURSE NUMBER	TITLE	FALL	SPRG	BOTH	VARY
Environmental Engineering Courses					
CEE 190	Project-Based Introduction to CEE	X			
CEE 201	Systems Engineering & Economics			X	
CEE 202	Engineering Risk & Uncertainty			X	
CEE 330	Environmental Engineering			X	
CEE 331	Fluid Dynamics in the Natural Built Environment	X			
CEE 340	Energy and Global Environment	X			
CEE 350	Water Resources Engineering			X	
CEE 433	Water Technology and Policy	X			
CEE 434	Environmental Systems I	X			
CEE 435	Public Health Engineering				X
CEE 437	Water Quality Engineering			X	
CEE 438	Science & Environmental Policy		X		
CEE 440	Fate Cleanup Environ Pollutant		X		
CEE 441	Air Pollution Sources, Transport & Control	X			
CEE 442	Env Eng Principles, Physical	X			
CEE 443	Env Eng Principles, Chemical	X			
CEE 444	Env Eng Principles, Biological	X			
CEE 447	Atmospheric Chemistry				X
CEE 449	Environmental Engineering Lab		X		
CEE 450	Surface Hydrology	X			
CEE 451	Environmental Fluid Mechanics	X			
CEE 452	Hydraulic Analysis and Design		X		
CEE 453	Urban Hydrology and Hydraulics		X		
CEE 457	Groundwater	X			
CEE 458	Water Resources Field Methods	X			
CEE 459	Ecohydraulics				X
CEE 490	Computer Methods		X		
CEE 491	Decision and Risk Analysis		X		
CEE 492	Data Science for CEE	X			
CEE 493	Sustainable Design Eng Tech	X			
CEE 495	Professional Practice	X			

COURSE NUMBER	TITLE	FALL	SPRG	BOTH	VARY
CEE 497	Independent Study			X	
CEE 498	Special Topics			X	
Other Courses					
ABE 436	Renewable Energy Systems	X			
ACE 100	Intro to Applied Microeconomics			X	
ACE 310	Natural Resources Economics			X	
ATMS 201	General Physical Meteorology			X	
ATMS 202	General Physical Climate			X	
ATMS 305	Computing and Data Analysis	X			
CHEM 102	General Chemistry I			X	
CHEM 103	General Chemistry Lab 1 (taken with CHEM 102)			X	
CHEM 104	General Chemistry II			X	
CHEM 105	General Chemistry Lab II (taken with CHEM 104)			X	
CHEM 232	Elementary Organic Chemistry			X	
CHEM 360	Chemistry of the Environment		X		
CS 101	Intro to Computing Eng & Sci			X	
ECE 316	Ethics and Engineering			X	
ECON 102	Microeconomics			X	
ENG 100	Grainger Engineering Orientation Seminar (1st yr)			X	
ENG 300	Engineering Orientation for External Transfer Students (1st yr)	X			
ENSU 301	Soc. Impacts Weather and Climate		X		
GGIS 379	Intro to Geographic Information Systems			X	
HK 201	Health Sciences Research Methods			X	
HK 207	Intro to Epidemiology			X	
HK 408	Environmental Health			X	
MATH 221	Calculus I	X			
MATH 231	Calculus II			X	
MATH 241	Calculus III			X	
MATH 257	Linear Algebra with Computational Applications			X	
MATH 285	Intro Differential Equations			X	
MATH 415	Applied Linear Algebra			X	
MCB 300	Microbiology			X	
ME 200	Thermodynamics			X	
PHYS 211	Univ Physics: Mechanics			X	
PHYS 212	Univ Physics: Elec & Mag			X	

COURSE NUMBER	TITLE	FALL	SPRG	BOTH	VARY
PHYS 213	Univ Physics: Thermal Physics			X	
SE 101	Engineering Graphics and Design			X	
TAM 211	Statistics			X	
TAM 212	Intro Dynamics			X	
TAM 335	Intro Fluid Mechanics			X	

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