**ENVIRONMENTAL ENGINEERING**

**Environmental Engineering Major**

The Department of Environmental Engineering and Earth Sciences (EEES) offers a four-year ABET-accredited degree program in Environmental Engineering (ENV). This program provides strong engineering and scientific experience with advanced techniques heavily integrated into the curriculum. Students intending to major in this program are encouraged to be well prepared in the sciences and mathematics. Specialization is achieved by means of the selection of appropriate technical electives.

The student professional chapters of the Society of Women Engineers (SWE), American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), and the Air & Waste Management Association (A&WMA), in conjunction with the Department of Environmental Engineering and Earth Sciences periodically offer seminars on subjects of a timely nature. Attending these seminars and taking the Engineers-in-Training (E.I.T.) Exam are mandatory for the completion of the degree in Environmental Engineering.

**Honors Program in Environmental Engineering**

Upon the recommendation and approval of the Environmental Engineering faculty, honor students in Environmental Engineering will be recognized upon completion of the following requirements: achievement of an overall grade point average of 3.25 or better; receipt of grades of 3.00 or better in all engineering courses of his or her discipline; pursuit of independent research or special projects in engineering; and presentation of research and project results at meetings, conferences, or by means of publication of a paper. The distinction "Honors in Engineering" will be recorded on the student's transcript upon graduation.

**Environmental Engineering Major - Required Courses and Recommended Course Sequence**

### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM-113 Elements and Compounds lab</td>
<td>1</td>
</tr>
<tr>
<td>CHM-115 Elements and Compounds</td>
<td>3</td>
</tr>
<tr>
<td>ENG-101 Composition</td>
<td>4</td>
</tr>
<tr>
<td>FYF-101 First-Year Foundations</td>
<td>3</td>
</tr>
<tr>
<td>ME-180 CADD Lab</td>
<td>1</td>
</tr>
<tr>
<td>MTH-111 Calculus I</td>
<td>4</td>
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**Total:** 16

### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Distribution Requirements</td>
<td>6</td>
</tr>
<tr>
<td>ENV-205 Environmental Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MTH-112 Calculus II</td>
<td>4</td>
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<table>
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<th>Course</th>
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<tbody>
<tr>
<td>Distribution Requirement</td>
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<tr>
<td>EES-240 Principles of Environmental Engineering and Science</td>
<td>4</td>
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<tr>
<td>ME-231 Statics</td>
<td>3</td>
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<tr>
<td>MTH-211 Intro. to Differential Equations</td>
<td>4</td>
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<tr>
<td>PHY-202 General Physics II</td>
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**Total:** 17

### Fourth Semester

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<tr>
<td>Distribution Requirements</td>
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<tr>
<td>EES-211 Physical Geology</td>
<td>4</td>
</tr>
<tr>
<td>ENV-201 Environmental Engineering Systems I</td>
<td>1</td>
</tr>
<tr>
<td>ME-232 Strength of Materials</td>
<td>3</td>
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<tr>
<td>ME-322 Thermodynamics</td>
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### Fifth Semester

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ENV-315 Soils</td>
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<tr>
<td>ENV-202 Environmental Engineering Systems II</td>
<td>2</td>
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<tr>
<td>ENV-321 Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>ME-321 Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>ME-323 Fluid Mechanics Lab</td>
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<td>Technical Elective**</td>
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<table>
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<tr>
<td>Distribution Requirement</td>
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<tr>
<td>EGM-320 Engineering Project Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EGR-201 Engineering Ethics</td>
<td>1</td>
</tr>
<tr>
<td>ENV-330 Water Quality</td>
<td>4</td>
</tr>
<tr>
<td>ENV-332 Air Quality</td>
<td>3</td>
</tr>
<tr>
<td>ENV-390 Junior Seminar</td>
<td>1</td>
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<tr>
<td>Technical Elective**</td>
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**Total:** 18

### Seventh Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENV-301 Environmental Engineering Systems III</td>
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<tr>
<td>ENV-305 Solid Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>ENV-350 Water and Wastewater Treatment Lab</td>
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<tr>
<td>ENV-356 Physical Chemical Treatment Processes</td>
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</tbody>
</table>

**Total:** 18

Wilkes University Undergraduate Bulletin 2018 - 2019
**Technical electives must include EES-271 (3 credits) or ENV (3 credits); has to be 200 or above or SUS 4XX and above); others can be any 200 or above level science or engineering course.

** ENV. ENVIRONMENTAL ENGINEERING **

ENV-198/298/398. TOPICS IN ENV
Credits: Varies with topic

Selected topics in the field of engineering and related areas. The may include the following topics: mechanical engineering; civil engineering; engineering management; geotechnology; and radiation.

Click here for fee for courses with a lab.

Pre-Requisites
Permission of the instructor.

ENV-395/396. INDEPENDENT RESEARCH
Credits: Varies with topic 1-3 credits.

Independent study or research for advanced students in the field of their major under the direction of a departmental faculty member.

Click here for course fees.

Pre-Requisites
Approval of department chair and academic advisor.

ENV-201. ENVIRONMENTAL ENGINEERING SYSTEMS I: CHEMICAL KINETICS AND STATISTICAL METHODS
Credits: 1

This course focuses on understanding the factors that control species behavior in environmental systems and provides the foundation for estimating pollutant concentrations and their fate in the environment. This course also provides an introduction of central ideas of probability and statistics and their application in the analysis of environmental data and information. One hour of lecture and one hour of discussion per week.

Pre-Requisites
CHM-113, CHM-115 or instructor's permission.

ENV-202. ENVIRONMENTAL ENGINEERING SYSTEMS II: ANALYTICAL AND COMPUTATIONAL ANALYSIS
Credits: 2

This course focuses on basic methods for obtaining numerical solutions of algebraic and transcendental equations, simultaneous linear equations, and curve fitting techniques; examples provided are relevant to environmental engineering processes; will include an introduction to problem-solving using Excel and MATLAB. Two hours of lab per week.

Pre-Requisites
MTH-111, MTH-112 or instructor's permission.

ENV-205. ENVIRONMENTAL MICROBIOLOGY
Credits: 1

The foundational concepts in microbiology that are important in environmental systems will be explored in this course. This will include the function and formation of cellular components starting from basic molecules (carbohydrates, fatty acids, amino acids, and nucleotides) to the cellular structures that are formed (membranes, proteins, and the nucleic acids RNA & DNA); carbon, energy, and nutrient sources required for cellular growth; and the metabolic pathways for substrates common in environmental systems will be shown. Biodegradation and growth kinetic models will be introduced.

ENV-298. TOPICS
Credits: Varies with topic

Selected topics in the field of engineering and related areas. The may include the following topics: mechanical engineering; civil engineering; engineering management; geotechnology; and radiation.

Click here course fee.

Pre-Requisites
Permission of the instructor.

ENV-301. ENVIRONMENTAL ENGINEERING SYSTEMS III: ADVANCED UNIT OPERATIONS AND PROCESSES
Credits: 1

Examination of unit operations and processes encountered in the environmental engineering field that will assist in the design and operation of advanced water, wastewater, and waste management treatment systems. One hour of lecture and one hour discussion per week.

Pre-Requisites
ENV-240

Co-Requisites
ENV-305, ENV-351 or instructor's permission.

ENV-305. SOLID WASTE MANAGEMENT
Credits: 3

Assessment of the scope of the solid waste problem and engineering and management strategies. Lecture topics include the following: solid waste sources; characterization and generation rates; collection and transportation technologies and management options; sanitary landfill design and operation; and recycling strategies and technologies. Three hours of lecture per week.

Pre-Requisites
EES-240, CHM-116 or EES-202, or permission of the instructor.
ENV-315. SOILS  
Credits: 3  
Study of the structure, properties, and classification of soils. Fundamental concepts of soils science are applied to the environmental management of terrestrial ecosystems. Topics include soil genesis, the classification, and physical properties of soils, soil chemistry, and soil moisture relationships. Two hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
EES-211, CHM-116 or EES-202.

ENV-321. HYDROLOGY  
Credits: 4  
A quantitative analysis of the physical elements and processes that constitute the hydrologic cycle. Topics include precipitation, infiltration, evaporation, runoff, streamflow, and ground water flow. Ground water modeling and advanced treatment of Darcy's Law is presented within the context of migration of ground water pollutants. Three hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
EES-211.

ENV-322. WATER RESOURCES ENGINEERING  
Credits: 3  
Design and development of selected projects in the various fields of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. A detailed progress report is required. Three hours of lecture per week.  
Pre-Requisites  
ENV-321.

ENV-330. WATER QUALITY  
Credits: 4  
The physical, chemical, and biological processes that affect the quality of water in the natural environment. The measurement of water quality parameters in water and wastes. The behavior of contaminants in ground and surface water. Three hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
CHM-116 or EES-202, EES-240.

ENV-332. AIR QUALITY  
Credits: 3  
Study of atmospheric pollutants, their sources and effects; measurement and monitoring techniques for air pollutants; atmospheric chemical transformations; regulatory control of air pollution; meteorology of air pollution; transport and dispersion of air pollutants; and introduction to indoor air pollution. Lab work includes both problem-oriented and hands-on exercises. Exercises include basic gas concepts, volume measuring devices, flow, velocity, and pressure measuring devices, calibration of such devices, and various sampling techniques. Two hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
CHM-116 or EES-202, EES-240.

ENV-351. WATER AND WASTEWATER TREATMENT  
Credits: 4  
Design of water and wastewater treatment systems. Estimation of demands. Physical, chemical, biological, and land-based treatment processes. Sludge handling and disposal. Three hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
ENV-330.

ENV-352. ENVIRONMENTAL ENGINEERING HYDRAULICS  
Credits: 3  
Water distribution, sewage collections, pipe network models, piping materials, pumps and pumping stations, valves and tanks. Design and operation. Three hours of lecture per week.  
Pre-Requisites  
ME-321.

ENV-353. AIR POLLUTION CONTROL  
Credits: 3  
This course provides the philosophy and procedures for design of air pollution control systems. Methods used for controlling air-borne emissions of gases, aerosols, and organic vapors are covered. Designs are carried out based on data for typical systems. Evaluations of alternatives with cost comparisons are also presented. Three hours of lecture per week.  
Pre-Requisites  
ENV-332.

ENV-354. HAZARDOUS WASTE MANAGEMENT  
Credits: 3  
An overview and application of engineering principles to management of hazardous wastes and the remediation of contaminated sites. Introduction to regulatory compliance and environmental laws. Three hours of lecture per week.  
Pre-Requisites  
ENV-351 or permission of the instructor.

ENV-373. OCCUPATIONAL HEALTH  
Credits: 3  
Appraisal of environmental health hazards, sampling techniques, instrumentation and analytic methods. Principles of substitution, enclosure, and isolation for the control of hazardous operations in industry. Three hours of lecture and demonstration per week. Requirement: Junior or senior standing in engineering.

ENV-391. SENIOR PROJECTS I  
Credits: 1  
Design and development of selected projects in the various fields of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. A professional paper and detailed progress report are required. Requirement: Senior standing and department permission. (See the department for more details about the department permission.)  
Click here for course fees.
ENV-392. SENIOR PROJECTS II  
**Credits:** 2  
Design and development of selected projects in the field of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. This is a continuation of ENV-391. A professional paper to be presented and discussed in an open forum is required.  
[Click here for course fees.]

**Pre-Requisites**  
ENV-391.

ENV-397. SEMINAR  
**Credits:** 1-3  
Presentations and discussions of selected topics and projects. Requirement: Senior standing in environmental engineering.

ENV-398. TOPICS  
**Credits:** Varies with topic  
Selected topics in the field of engineering and related areas. The may include the following topics: mechanical engineering; civil engineering; engineering management; geotechnology; and radiation.  
[Click here course fee.]

**Pre-Requisites**  
Permission of the instructor.

ENV-399. COOPERATIVE EDUCATION  
**Credits:** 1-6  
Professional cooperative education placement in a private or public organization related to the student’s academic objectives and career goals. In addition to their work experiences, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student’s discipline. See the Cooperative Education section of this bulletin for placement procedures.

**Pre-Requisites**  
Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.