

**REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE/
 MASTER OF ENVIRONMENTAL SCIENCE
 GALLOGLY COLLEGE OF ENGINEERING
 THE UNIVERSITY OF OKLAHOMA**

For Students Entering the Oklahoma State System for Higher Education
Summer 2018 through Spring 2019

GENERAL REQUIREMENTS	
Total Credit Hours	145-147•
Minimum Retention/Graduation Grade Point Averages:	
Overall - Combined and OU	3.00
Major - Combined and OU	3.00
Curriculum - Combined and OU	3.00
A minimum grade of C is required for each course in the curriculum.	

Environmental Science
A405
 Bachelor of Science in Environmental Science/
 Master of Environmental Science F405

OU encourages students to complete at least 29-31 hours of applicable coursework each year to have the opportunity to graduate in five years.

Year	FIRST SEMESTER			Hours	SECOND SEMESTER			Hours
FRESHMAN	ENGL 1113, Prin. of English Composition (Core I)		3	BIOL 1134, Intro. Biology: Evolution, Ecology & Diversity, or		4		
	*CHEM 1315, General Chemistry (Core II)		5	PBIO 1114, General Botany				
	◆MATH 1823, Calculus and Analytic Geometry I (Core I)		4	ENGL 1213, Prin. of English Composition (Core I), or		3		
	HIST 1483, U.S., 1492-1865, or 1493, U.S., 1865-Present (Core IV)		3	EXPO 1213, Expository Writing (Core I)				
	CEES 1112, Intro. to Civil Engr. & Environmental Science		2	*CHEM 1415, General Chemistry		5		
ENGR 1410, Freshman Engineering Orientation I		0	◆MATH 2423, Calculus and Analytic Geometry II		3			
	TOTAL CREDIT HOURS			16	TOTAL CREDIT HOURS			15
SOPHOMORE	CHEM 3053, Organic Chemistry I: Biological Emphasis		3	CHEM 3153, Organic Chemistry II: Biological Emphasis		3		
	PHYS 2514, Gen. Physics for Engineering & Science, or 2414, Gen. Physics for Life Sciences		4	MBIO 2815, Introduction to Microbiology		5		
	CEES 2313, Water Quality Fundamentals		3	PHYS 2524, General Physics for Engineering & Science, or 2424, General Physics for Life Sciences		4		
	§CEES 1000, CEES Seminar		0	CEES 2323, Environmental Transport and Fate Process		3		
	CEES 2213, CADD Fundamentals		3	§CEES 1000, CEES Seminar		0		
	BIOL 3403, Principles of Ecology, or PBIO 3453, Principles of Plant Ecology		3	ENGR 2002, Professional Development		2		
	TOTAL CREDIT HOURS			16	TOTAL CREDIT HOURS			17
JUNIOR	†Approved Elective: Artistic Forms (Core IV)		3	ANTH 4623, Approaches to Cross-Cultural Human Problems or approved substitute (Core IV, Non-Western Civ.)		3		
	§CEES 1000, CEES Seminar		0	ENGL 3153, Technical Writing		3		
	CEES 4114, Aquatic Chemistry		4	GEOG 4293, Hydrologic Science		3		
	CEES 4263, Hazardous & Solid Waste Management		3	§CEES 1000, CEES Seminar		0		
	CEES 4324, Environmental Biology & Ecology		4	CEES 4253, Statistics and Probability		3		
TOTAL CREDIT HOURS			14	TOTAL CREDIT HOURS			15	
† Admission to the accelerated program is by application and requires a minimum GPA of 3.20.								
SENIOR	HSCI 3333, Technology and Society in World History, or approved substitute (Core IV, West. Civ. & Culture)		3	§CEES 1000, CEES Seminar		0		
	P SC 1113, American Federal Government (Core III)		3	CEES 4913, Environmental Science Capstone (Capstone)		3		
	§CEES 1000, CEES Seminar		0	▲CEES Track Elective		3		
	CEES 4911, Introduction to ES Capstone		1	▲CEES Track Elective		3		
	◆CEES Professional Elective		3	◆CEES Professional Elective		3		
	▲CEES Track Elective		3	†Approved Elective: Social Science (Core III)		3		
TOTAL CREDIT HOURS			13	TOTAL CREDIT HOURS			15	
Students are eligible for graduate status upon graduation with the Bachelor of Science in Environmental Science.								
FIFTH YEAR	CEES Graduate-level Elective		3	CEES 5021, Technical Communications or Graduate-level Elective		1-3		
	CEES Graduate-level Elective		3	◆CEES 5980, Thesis Research, or Graduate-level Elective		5-6		
	CEES Graduate-level Elective		3	CEES Graduate-level Elective		3		
	CEES Graduate-level Elective		2-3	CEES Graduate-level Elective		3		
	TOTAL CREDIT HOURS			11-12	TOTAL CREDIT HOURS			12-15

◆ Dependent upon whether a student chooses the thesis or non-thesis option. Non-thesis option additionally requires: CEES Graduate-level Elective (6 hrs.).

† Students may enter the accelerated program based on the undergraduate degree pattern offered in the year they first enrolled in the Oklahoma State System of Higher Education or later.

NOTE: Engineering transfer students may take ENGR 3410 in place of ENGR 1410 and ENGR 1420.

Courses designated as Core I, II, III, IV, or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list.

*CHEM 1315 and CHEM 1415 can be substituted with CHEM 1335 (Fall only) and 1435 (Spring only), respectively.

† To be chosen from the **University-Wide General Education Approved Course List**. Three of these 12 hours must be upper-division (3000-4000). See list in the Class Schedule.

In the College of Engineering, in order to progress in your curriculum, and as a specific graduation requirement, a grade of C or better is required in each course in the curriculum. Please refer to the General Catalog for additional enrollment limitations.

Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.

• Two college-level courses in a single foreign language are required; this may be satisfied by successful completion of 2 years in a single foreign language in high school. Students who must take foreign language at the University will have an additional 6-10 hours of coursework.

‡ The Environmental Science electives will be selected from CEES courses with the approval of the adviser.

Students must choose a specialization in either **Environmental Science** or **Environmental Management**.

§ Students must complete a minimum of four semesters of CEES 1000.

◆ Professional electives can be chosen from any 3000-level or higher course in CEES. One three-hour professional elective can be taken outside CEES with adviser approval.

▲ See Student Handbook for the list of Track electives.

◆ MATH 1914, 2924, and 2934 sequence can be substituted for MATH 1823, 2423, 2433, and 2443.

COURSES IN ANTHROPOLOGY

4623 Approaches to Cross-Cultural Human Problems. Prerequisite: 1113 or junior standing. Introduces students to the complex problems of contemporary global-scale cultures and helps them better understand their place on this global arena. This course will look at specific international issues or problems, and relate them to processes occurring in many parts of the world. (Irreg.) [IV-NW]

COURSES IN BIOLOGY (BIOL)

1134 Introductory Biology: Evolution, Ecology and Diversity. Prerequisite: Life science majors only. Major biological principles and concepts as illustrated in a survey of the diversity, behavior, and ecological functions of animals, plants, fungi, and microbes. Emphasis is on evolution, ecology, and diversity. Will include biological laboratory experience with emphasis on problem solving. Problems will be derived from topics in evolution, ecology, and diversity. Will include training in scientific procedures, including laboratory technical skills, writing skills, and introduction to statistical analysis. Recitation will include discussion and case study analysis of the major biological principles presented in the lecture within the context of health and the environment. Will involve problem sets, primary journal articles, and writing assignments. Includes both online and classroom activities. **Laboratory** (Sp) †**G3403 Principles of Ecology.** Prerequisite: 1114 and 1121, or 1134, or Plant Biology 1114. Patterns of environments and biological communities; the processes maintaining these patterns. **Laboratory** (F, Sp)

COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, atomic theory, electron configuration, periodicity, chemical reactivity and energetics, stoichiometry, gas laws and changes in state, bonding and molecular structure. A student may not receive credit for this course and CHEM 1335. **Laboratory.** (F, Sp, Su) [II-LAB]

1415 General Chemistry (Continued). Prerequisite: CHEM 1315 with a minimum grade of C or CHEM 1335 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include thermochemistry, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. A student may not receive credit for this course and CHEM 1435. **Laboratory.** (F, Sp, Su) [II-LAB]

3053 Organic Chemistry I: Biological Emphasis. Prerequisite: CHEM 1415 or CHEM 1425. Intended for life science majors. First course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic structure, nomenclature, and reactivity with an emphasis on biological applications. (F, Sp, Su)

3153 Organic Chemistry II: Biological Emphasis. Prerequisite: CHEM 3053 with a grade of C or better. Intended for life science majors. Second course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic chemical reactivity with an emphasis on carbohydrates, lipids, and proteins. (F, Sp, Su)

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

1000 CEES Seminar. Seminar provides a common meeting time for students and faculty for department activities, such as invited speakers, project presentations, educational surveys, cross-course project coordination, and policy announcements. Students must enroll every semester that they are matriculated in CEES at OU after the freshman year, but in no case can a student graduate without successfully completing four semesters of seminar. (F, Sp)

1112 Introduction to Civil Engineering and Environmental Science. Prerequisite: freshman only. Introduction to fundamental concepts (mass/flow balance), problem solving and design, and simple computing software for architectural, civil or environmental engineers and environmental scientists. (F)

2213 CADD Fundamentals. Prerequisite: CEES Majors only and Sophomore standing. Introduction to computer aided design and drafting with a focus on the AutoCAD and MicroStation platforms. This course is primarily about learning to use the software and learning how to convey an engineering design graphically. (F)

2313 Water Quality Fundamentals. Prerequisite: Chemistry 1415, Mathematics 2423 or 2924. Introduction to environmental mass balance and fate processes. Studies of mass and energy transfer, introductory environmental chemistry, water quality parameters, mathematics of growth, statistics and data analysis, introduction to environmental laws and regulations. (F)

2323 Environmental Transport and Fate Process. Prerequisite: 2313. Physicochemical and biological processes controlling contaminant distribution and fate; hydrological processes controlling contaminant transport; sources, prevention and remediation of environmental pollutants. (Sp)

4114 Aquatic Chemistry (Slashlisted with 5114). Prerequisite: senior standing and one year of general chemistry. Environmental kinetics and thermodynamics in aquatic systems; acid/base, precipitation/solubility, metal complexation and oxidation/reduction reactions; environmental colloidal and solid-liquid interface chemistry. No student may earn credit for both 4114 and 5114 or Environmental Science 4114 and 5114. **Laboratory** (F)

4253 Statistics and Probability. Prerequisite: MATH 2423 or 2924 and PHYS 2524 or 2424.

Designed to help students understand the fundamentals of probability, statistics, reliability, and risk methods in support of decision making for future engineers and scientists. Fundamental concepts in probability and statistics will be reviewed and used throughout the course. Engineering decisions are often based on data that contain uncertainty; future scientists and engineers should understand how uncertainty affects calculated quantities, accuracy, precision, and reliability. (Sp)

G4263 Hazardous and Solid Waste Management. Prerequisite: junior or above status in CEES or permission of instructor. Sources and types of solid wastes; identification and classification of hazardous wastes; waste handling, transportation, treatment and disposal techniques, federal and state legislation; and environmental and health effects. (F)

4324 Environmental Biology and Ecology (Slashlisted with 5324). Prerequisite: CEES 2323. Examines applied environmental biology; biological consequences of environmental impacts; mitigation of environmental impacts via biogeochemical, ecological and microbial processes. No student may earn credit for both 4324 and 5324. **Laboratory** (F)

4911 Introduction to ES Capstone. Prerequisite: Senior standing in Environmental Science. Introduction to the capstone design project, which is a two-semester-long, open-ended engineering design problem that requires applying the skills and techniques acquired in earlier

engineering course work. This course will focus on introducing the project requirements; forming multi-disciplinary teams of students; developing team identities; assigning team roles; evaluating project constraints; and developing a project design schedule. (F)

4913 Environmental Science Capstone. Prerequisite: CEES 4114, CEES 4324, CEES 4911; and CEES 4253 co-requisite. The capstone experience draws upon undergraduate course work in environmental science, biology, chemistry, physics, mathematics, and related sciences. Student teams address a client-driven, open-ended, real-world problem. Faculty coordinators serve in advisory capacities only, introducing field, laboratory, and computer methods and coordinating class meetings and presentations. Any other in-class presentations cover non-traditional (non-technical) topics. (Sp) [V]

4943 Air Quality Management. Prerequisite: MATH 2423 or 2924; and CHEM 1315. Important aspects of air quality will be covered, including air quality legislation, major sources and effects of air pollutants, monitoring, atmospheric dispersion, and air quality modeling. (Sp)

G5020 Special Topics in Civil Engineering. 1 to 6 hours. Prerequisite: senior or graduate standing and permission of instructor. May be repeated with change of topic; maximum credit twelve hours. Examines subject matter in civil engineering not covered by existing course offerings as a regular course. (F, Sp, Su)

G5021 Technical Communications. Prerequisite: CEES graduate standing or permission of instructor. Focused on enabling students to improve oral and written communications skills. Examines appropriate formats for various technical publications, as well as methods and practices for developing effective oral presentations. Each student will be required to develop an oral presentation about his/her written product. (Sp)

G5980 Research for Master's Thesis. Variable enrollment, two to nine hours; maximum credit applicable toward degree, four hours. (F, Sp, Su)

COURSES IN ENGINEERING (ENGR)

1410 Freshman Engineering Orientation I. Prerequisite: declared major in engineering. All entering freshmen with a declared engineering major are required to enroll. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the College of Engineering, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean's Leadership Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area. (F)

2002 Professional Development. Prerequisite: ENGR 1410 or ENGR 1411, or ENGR 3511 or ENGR 3410 or concurrent enrollment; ENGL 1213 or EXPO 1213, and sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

COURSES IN ENGLISH (ENGL)

3153 Technical Writing. Prerequisite: 1213 and Engineering or hard science majors only. For students of the pure and applied sciences. Focuses on the forms of report writing most frequently encountered in research and industry. (F, Sp, Su)

COURSES IN GEOGRAPHY (GEOG)

4293 Hydrologic Science (Slashlisted with 5293). Prerequisite: Math 1823 or 1914, and either Physics 2414, 2514 or Chemistry 1315. Study of the processes which control the storage and movement of water at global, regional, and local scales. The emphasis is on the land portion of the hydrologic cycle, and includes the study of processes such as infiltration, soil water flow in the saturated and unsaturated zone, rainfall/runoff and evaporation. Lab sections include exercises on a computer in the field and in a soils lab. No student may earn credit for both 4293 and 5293. (Sp)

COURSES IN HISTORY OF SCIENCE (HSCI)

3333 Technology and Society in World History. Prerequisite: junior standing, or completion of one History of Science lower-division course, or permission of instructor. A survey of the history of technology since 1500. Emphasizes historical contexts and cultural meanings, not technical details, as it explores the key steps in the construction of our modern technological world. Materials include literature and film as well as non-fiction. (Sp) [IV-WC]

COURSES IN MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the math assessment. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

2423 Calculus and Analytic Geometry II. Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

COURSES IN MICROBIOLOGY (MBIO)

2815 Introduction to Microbiology. Prerequisite: one course in college chemistry. Introduction to microorganisms as biological entities. Survey of the roles of microorganisms in the ecosystem. Application of microorganisms to industrial and environmental problems. Discussion of microorganisms as causes of human disease and response of hosts to microbial invasion. This course does not count for major credit in Microbiology or Botany. **Laboratory** (F, Sp, Su) [II-LAB]

COURSES IN PHYSICS (PHYS)

2514 General Physics for Engineering and Science Majors. Prerequisite: Mathematics 1823 or Mathematics 1914 with grade of C or better. Not open to students with credit in 1205. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

2524 General Physics for Engineering and Science Majors. Prerequisite: 2514 and Mathematics 2423 or 2924 with a grade of C or better. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

COURSES IN PLANT BIOLOGY (P BIO)

1114 General Botany. Previous course in chemistry (high school or college) recommended. Fulfills Arts and Sciences' biological science requirement. Basic processes and structures in plants; their relation to factors in the environment; reproduction; heredity, heritable and nonheritable variations in plants and their causes and consequences are studied. Scientific procedures are acquired through application and discussion. **Laboratory** (F, Sp, Su) [II-LAB]