

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING/MASTER OF SCIENCE

B.S. Portion of the Program Accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

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 **149-151**
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 Engineering
A390
Bachelor of Science in Environmental Engineering/Master of Science (Envir. Engr.) **F390**

OU encourages students to complete at least 30-31 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	ENGL 1213, Prin. of English Composition (Core I), or	3
	#CHEM 1315, General Chemistry (Core II)	5	EXPO 1213, Expository Writing (Core I)	
	HIST 1483, U.S., 1492-1865, or 1493, U.S., 1865-Present (Core IV)	3	#CHEM 1415, General Chemistry	5
	♦MATH 1914, Differential and Integral Calculus I (Core I)	4	♦MATH 2924, Differential and Integral Calculus II	4
	CEES 1112, Intro. to Civil Engr. & Environmental Science	2	PHYS 2514, General Physics for Engr. & Science (Core II)	4
	ENGR 1410, Freshman Engineering Orientation	0		
	TOTAL CREDIT HOURS	17	TOTAL CREDIT HOURS	16
SOPHOMORE	♦MATH 2934, Differential and Integral Calculus III	4	HSCI 3333, Inventing the Modern World (Core IV, West. Civ. & Culture), or approved substitute	3
	PHYS 2524, General Physics for Engr. & Science	4	MATH 3113, Introduction to Ordinary Differential Equations	3
	*CEES 1000, CEES Seminar	0		
	CEES 2213, CADD Fundamentals	3	*CEES 1000, CEES Seminar	0
	CEES 2113, Statics	3	CEES 2153, Mechanics of Materials	3
	CEES 2313, Water Quality Fundamentals	3	CEES 2223, Fluid Mechanics	3
			CEES 2323, Environmental Transport and Fate Process	3
		ENGR 2002, Professional Development	2	
	TOTAL CREDIT HOURS	17	TOTAL CREDIT HOURS	17
JUNIOR	CHEM 3053, Organic Chemistry	3	ENGL 3153, Technical Writing	3
	*CEES 1000, CEES Seminar	0		
	CEES 3213, Water Resources Engineering	3	*CEES 1000, CEES Seminar	0
	CEES 3363, Soil Mechanics	3	CEES 3243, Water & Wastewater Treatment Design	3
	CEES 3361, Soil Mechanics Lab	1	CEES 4253, Statistics and Probability	3
	ENGR 3401, Engineering Economics	1	CEES 4943, Air Quality Management	3
	§Professional Elective	3	ENGR 2461, Thermodynamics	1
		†Approved Elective: Social Science (Core III)	3	
	TOTAL CREDIT HOURS	14	TOTAL CREDIT HOURS	16
† Admission to the accelerated program is by application and requires a minimum GPA of 3.20.				
SENIOR	*CEES 1000, CEES Seminar	0	ANTH 4623, Approaches to Cross-Cultural Human Problems or approved substitute (Core IV, Non-Western Civ.)	3
	CEES 4114, Aquatic Chemistry	4	P SC 1113, American Federal Government (Core III)	3
	CEES 4263, Hazardous and Solid Waste Management	3	*CEES 1000, CEES Seminar	0
	CEES 4324, Environmental Biology and Ecology	4	CEES 4923, Environmental Engineering Capstone (Capstone)	3
	CEES 4921, Intro to EE Capstone	1	§Professional Elective	3
	CEES 4951, Contemporary Topics in Professional Practice	1		
			†Approved Elective: Artistic Forms (Core IV)	3
	TOTAL CREDIT HOURS	13	TOTAL CREDIT HOURS	15
Students are eligible for graduate status upon graduation with the Bachelor of Science in Environmental Engineering.				
FIFTH YEAR	CEES Graduate-level Elective	3	♦CEES 5980, Thesis Research, or Graduate-level Elective	5-6
	CEES Graduate-level Elective	3	CEES 5021, Technical Communications or Graduate-level Elective	1-3
	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.

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

• 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.

§ 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.

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

Environmental Engineering Accelerated BS/MS—A390/F390—Page 2 COURSES IN ANTHROPOLOGY (ANTH)

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 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]

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)

2113 Statics. Prerequisites: Physics 2514 and Mathematics 2433 or 2934 or concurrent enrollment in Mathematics 2433 or 2934. Vector representation of forces and moments: general three-dimensional theorems of statics; centroids and moments of area and inertia. Free-body diagrams, equilibrium of a particle and of rigid bodies, distributed loads, friction and internal shear and moment loads. Analysis of trusses, frames, and machines. (F)

2153 Mechanics of Materials. Prerequisites: 2113 or AME 2113 or PE 2113. Basic principles of mechanics, including the definition of stress and strain, transformations and principal values for the stress and strain tensors, kinematic relations, review of conservation equations and the development and application of constitutive laws for idealized materials. Elementary elastostatics utilizing Hooke's law; constitutive relations for a linear-elastic continuum, including elastic parameters such as Young's modulus, shear and bulk moduli and Poisson's ratio. Solution of elementary one- and two-dimensional mechanics problems, including thermal stresses and strains, beam flexure, shear and deflections, pressure vessels and buckling of columns. (Sp)

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)

2223 Fluid Mechanics. Prerequisites: 2113 or AME 2113 or PE 2113, and Math 3113 or concurrent enrollment. Coverage of the fundamentals of fluid statics and dynamics. Formulation of the equation of fluid flow, i.e., Navier-Stokes equation, Eulers equations, Bernoulli equations, etc. and their application. Examples of ideal fluid flow, such as flow in open and closed conduits. (Sp)

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)

3213 Water Resources Engineering. Prerequisite: 2223 or permission of instructor. Municipal water demands, surface water hydrology, ground water hydrology, water distribution systems, pump design, wastewater collection systems, storm water management, water law. (F)

3243 Water and Wastewater Treatment Design. Prerequisite: CEES 2223. Design of municipal water and wastewater treatment plants. Emphasis is placed on the characterization of water and wastewater and physical, chemical and biological treatment methods. Sludge processing advanced treatment methods and treatment plant hydraulics are also considered. (Sp)

3361 Soil Mechanics Lab. Prerequisite: CEES 2153 or PE 2153; CEES 3363 or concurrent enrollment (you must be enrolled in both lecture and lab section together the first time you attempt either). This is one of two complimentary courses taken in the area of Geotechnical Engineering and serves as an introduction to soil mechanics. During this course, the student will conduct simple laboratory tests to identify and classify soils, characterize the compacted properties of soil, and quantify soil permeability, compressibility and strength. (F)

3363 Soil Mechanics. Prerequisite: CEES 2153 or PE 2153; CEES 3361 or concurrent enrollment (you must be enrolled in both lecture and a lab section together the first time you attempt either). General treatment of the physical and mechanical properties of soils. Topics include soil composition, classification, phase relationships, compaction, effective stress, consolidation, shear strength and permeability and seepage. (F)

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)

4921 Introduction to EE Capstone. Prerequisites: Senior standing in Environmental Engineering. 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)

4923 Environmental Engineering Capstone. Prerequisite: CEES 3213, CEES 4114, CEES 4324, CEES 4921; CEES 4253 or concurrent enrollment. The capstone experience is a course where students draw upon their undergraduate course work for analysis of an open-ended, real world problem. Faculty coordinators serve in advisory capacities only. All in-class presentations will cover non-traditional (non-technical) topics. Students are presumed to have been trained in basic natural and engineering sciences and introduced to environmental sampling/analysis and impact/risk assessment methods. (Sp) [V]

4943 Air Quality Management. Prerequisite: MATH 2423 or 2924; and CHEM 1315. Important topics to be covered, including air quality legislation, major sources and effects of air

pollutants, monitoring, atmospheric dispersion, and air quality modeling. (Sp)
4951 Contemporary Topics in Professional Practice. Prerequisite: junior standing in Civil Engineering. Civil engineering is a dynamic profession, as methods of practice evolve to address the many pressing problems in today's built and natural environment. This course provides an introduction to contemporary topics in professional practice, such as basic concepts of sustainability in engineering design, modern tools for project management, and the role of business/policy considerations in practice. (F)

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)

2461 Thermodynamics. Prerequisite: Mathematics 2433 or 2934; and Physics 2524 or concurrent enrollment. Introduction to basic principles of thermodynamics. Topics include density, pressure, and temperature, the first law of thermodynamics for a system, the first law of thermodynamics for a control volume, the second law of thermodynamics, and psychometrics. (F)

3401 Engineering Economics. Prerequisite: MATH 1823 or 1914 and CEES 2153 or PE 2153 or AME 2153. Introduction to basic principles of engineering economics. Topics include value and interest, cash flow diagrams and patterns, equivalence of cash flow patterns, unusual cash flows and interest periods, evaluating alternatives (annual equivalent cost comparisons, present equivalent cost comparisons, incremental approach, rate of return comparisons, benefit/cost comparisons, MARR, replacement problems, always ignore the past, break-even analysis), income tax, depreciation, and inflation. (F, Sp)

COURSES IN MATHEMATICS (MATH)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the math assessment. Duplicates three hours of MATH 1823 and one hour of MATH 2423. Limits and continuity, differentiation, applications of differentiation to optimization and curve sketching, integration, the fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas and volumes. (F, Sp, Su) [I-M]

2924 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Duplicates two hours of 2423 and two hours of 2433. The natural logarithmic and exponential functions, indeterminate forms, techniques of integration, improper integrals, parametric curves and polar coordinates, infinite sequences and series, vectors in two and three dimensions. (F, Sp, Su)

2934 Differential and Integral Calculus III. Prerequisite: 2924 with grade of C or better. Duplicates one hour of 2433 and three hours of 2443. Vectors and vector functions, functions of several variables, partial differentiation and gradients, multiple integration, line and surface integrals, Green-Stokes-Gauss theorems. (F,Sp,Su)

†**G3113 Introduction to Ordinary Differential Equations.** Prerequisite: MATH 2423 or MATH 2924. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transformations, phase planes and stability. (F, Sp, Su)

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: PHYS 2514 and MATH 2423 or MATH 2924 with grade of C or better. Not open to students with credit in PHYS 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)