

# REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING

Accredited by ABET, Inc., (formerly the Accrediting Board for Engineering and Technology)

## COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

### GENERAL REQUIREMENTS

Total Credit Hours . . . . . **125\***  
**Minimum Retention/Graduation Grade Point Averages:**  
 Overall - Combined and OU . . . . . **2.00**  
 Major - Combined and OU . . . . . **2.00**  
 Curriculum - Combined and OU . . . . . **2.00**  
**A minimum grade of C is required for each course in the curriculum.**

Environmental Engineering

**B390**

Bachelor of Science in  
Environmental Engineering

For Students Entering the  
Oklahoma State System  
for Higher Education  
**Summer 2009 through  
Spring 2010**

**OU encourages students to complete at least 32 hours of applicable coursework each year to have the opportunity to graduate in four years.**

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
<b>FRESHMAN</b>	<b>ENGL 1113</b> , Prin. of English Composition (Core I)	3	<b>ENGL 1213</b> , Prin. of English Composition (Core I), <b>or</b>	3
	<b>CHEM 1315</b> , General Chemistry (Core II)	5	<b>EXPO 1213</b> , Expository Writing (Core I)	
	<b>HIST 1483</b> , U.S., 1492-1865, <b>or</b>	3		
	<b>1493</b> , U.S., 1865-Present (Core IV)		<b>CHEM 1415</b> , General Chemistry	5
	<b>MATH 1823</b> , Calculus & Analytic Geometry I (Core I)	3	<b>MATH 2423</b> , Calculus & Analytic Geometry II (Core I)	3
	<b>#CEES 1112</b> , Intro. to Civil Engr. & Envir. Science	2	<b>PHYS 2514</b> , General Physics for Engr. & Science (Core II)	4
<b>ENGR 1410</b> , Freshman Engineering Orientation	0			
	<b>TOTAL CREDIT HOURS</b>	<b>16</b>	<b>TOTAL CREDIT HOURS</b>	<b>15</b>
<b>SOPHOMORE</b>	<b>MATH 2433</b> , Calculus & Analytic Geometry III	3	<b>MATH 2443</b> , Calculus & Analytic Geometry IV	3
	<b>PHYS 2524</b> , General Physics for Engr. & Science	4	<b>MATH 3113</b> , Introduction to Ordinary Differential Equations	3
	<b>*CEES 1000</b> , CEES Seminar	0	<b>ENGR 2002</b> , Professional Development	2
	<b>CEES 1213</b> , Computing Applications in CEES	3	<b>*CEES 1000</b> , CEES Seminar	0
	<b>CEES 2113</b> , Statics & Dynamics	3	<b>CEES 2153</b> , Mechanics of Materials	3
	<b>CEES 2313</b> , Water Quality Fundamentals	3	<b>CEES 2223</b> , Fluid Mechanics	3
			<b>CEES 2323</b> , Environmental Transport and Fate Process	3
	<b>TOTAL CREDIT HOURS</b>	<b>16</b>	<b>TOTAL CREDIT HOURS</b>	<b>17</b>
<b>JUNIOR</b>	<b>CEES 3213</b> , Water Resources Engineering	3	§Professional or Science Elective	3
	<b>CHEM 3053</b> , Organic Chemistry	3	†Approved Elective: Social Science (Core III)	3
	<b>CHEM 3423</b> , Physical Chemistry I	3		
	<b>ENGL 3153</b> , Technical Writing	3		
	<b>*CEES 1000</b> , CEES Seminar	0	<b>*CEES 1000</b> , CEES Seminar	0
	<b>CEES 3364</b> , Soil Mechanics	4	<b>CEES 3243</b> , Water & Wastewater Treatment Design	3
		<b>CEES 3334</b> , Measurements in CEES	4	
	<b>TOTAL CREDIT HOURS</b>	<b>16</b>	<b>TOTAL CREDIT HOURS</b>	<b>13</b>
<b>SENIOR</b>	<b>*CEES 1000</b> , CEES Seminar	0	<b>ANTH 4623</b> , Approaches to Cross-Cultural Human Problems or approved substitute (Core IV, Non-Western Civ.)	3
	<b>CEES 4114</b> , Aquatic Chemistry	4	<b>P SC 1113</b> , American Federal Government (Core III)	3
	<b>CEES 4234</b> , Applied Environmental Microbiology	4	§Professional Elective	3
	<b>CEES 4263</b> , Hazardous and Solid Waste Management	3	†Approved Elective: Artistic Forms (Core IV)	3
	<b>CEES 4813</b> , Professional Practice	3	<b>*CEES 1000</b> , CEES Seminar	0
	<b>HSCI 2333</b> , Inventing the Modern World, or approved substitute (Core IV, West. Civ. & Culture)	3	<b>CEES 4923</b> , Environmental Engineering Design (Capstone)	3
	<b>TOTAL CREDIT HOURS</b>	<b>17</b>	<b>TOTAL CREDIT HOURS</b>	<b>15</b>

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

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.

†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.

#This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.

§Chosen from list of professional electives with approval of the faculty adviser. List and elective form are available in CEES Undergraduate Student Handbook.

## 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. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, gas laws and changes in state, stoichiometry, atomic theory, electron configuration, periodicity, bonding, molecular structure and thermochemistry. **Laboratory** (F, Sp, Su) [III-LAB]

**1415 General Chemistry (Continued).** Prerequisite: 1315 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include: nature of solutions, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. **Laboratory** (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.** 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)

**1213 Computing Applications in Civil Engineering and Environmental Science.** Prerequisite: Mathematics 2423, Physics 2514 or concurrent enrollment. Introduction to a computer-aided engineering and environmental science. Introduction to application software and tools relevant to civil engineering and environmental science such as AutoCAD, Java and spreadsheets. (F)

**2113 Statics and Dynamics (Crosslisted with Petroleum Engineering 2113).** Prerequisites: Physics 2514 and Mathematics 2433 or concurrent enrollment in Mathematics 2433. Vector representations of forces and moments; general three-dimensional theorems of statics and dynamics; centroids and moments of area and inertia. Free-body diagrams, equilibrium of a particle and of rigid bodies, principles of work and energy; principle of impulse-momentum. Motion of particles and rigid bodies in translating and rotating reference frames. Newton's law of motion and Lagrange's equation, including application to lumped-parameter systems. Analyses of trusses, frames and machines. (F, Sp)

**2153 Mechanics of Materials.** Prerequisites: 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)

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

**2313 Water Quality Fundamentals.** Prerequisite: Chemistry 1415, Mathematics 2423. 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)

**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: 2223 and 2313. 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)

**3334 Measurements in CEES.** Prerequisites: Mathematics 2423, Physics 2424 or Physics 2524. Introduction to measurement (laboratory and field) techniques, data analysis and interpretation and applications to architectural, civil or environmental engineering and environmental science problems. Topics include statistics, land surveying, remote sensing, GIS, environmental sampling and analysis and sensors. **Laboratory** (Sp)

**3364 Soil Mechanics.** Prerequisite: 2153. General treatment of the physical and mechanical properties of soils. Theories of effective stress, consolidation, lateral earth pressure, bearing capacity, slope stability and groundwater flow. **Laboratory** (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)

**4234 Applied Environmental Microbiology (Slashlisted with 5234).** Prerequisite: 2323 and 3243. Basic environmental microbiology and bioenvironmental engineering. Presentation of the diversity and importance of organisms involved in solid and liquid waste reduction. The course examines basic microbiology, biodegradation mechanisms, bioavailability, biotreatability studies, groundwater remediation (both oxic and anoxic), and bioengineering process technologies. No student may earn credit for both 4234 and 5234. **Laboratory** (F)

**4263 Hazardous and Solid Waste Management.** Prerequisite: 2323 or 3213. 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)

**4813 Environmental Science and Environmental Engineering Professional Practice.** Prerequisite: senior standing in environmental science or environmental engineering, 4603 or Civil Engineering 3213, and Civil Engineering 3334. Nature of profession, duties and administrative responsibilities. Organization and management of operating divisions with emphasis on role of environmental professional. Functional approach to planning and implementing public works needs with emphasis on role of environmental professional. (F)

**4923 Environmental Engineering Design.** Prerequisite: Civil Engineering 4803 and senior standing. Solution of major design problems by a team approach of disciplines. Problems to be varied within the area of environmental engineering (water resources; water and wastewater treatment; environmental remediation; hazardous and solid waste design) according to the student's major interest. The design project will be under direct staff supervision. (Sp) [V]

## COURSES IN ENGINEERING (ENGR)

**1410 Freshman Engineering Orientation.** Prerequisite: freshman majoring in Civil Engineering, Architectural Engineering, Environmental Engineering, or Environmental Science. Required orientation course for specified majors. Covers a variety of topics including: majors and minors; career planning; advising; and extra-curricular activities. (F)

**2002 Professional Development.** Prerequisite: 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 HISTORY OF SCIENCE (HSCI)

**2333 Inventing the Modern World.** A survey of the history of technology since 1500. The course 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. (F) [IV-WC]

## COURSES IN MATHEMATICS (MATH)

**1823 Calculus and Analytic Geometry I.** Prerequisite: 1523 at OU, or satisfactory score on the placement test, or, for incoming freshmen direct from high school, satisfactory score on the ACT/SAT. 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]

**2433 Calculus and Analytic Geometry III.** Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

**2443 Calculus and Analytic Geometry IV.** Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

**†G3113 Introduction to Ordinary Differential Equations.** Prerequisite: 2423. 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. 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. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)