REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN CIVIL ENGINEERING

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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**	Civil Engineering **B190** Bachelor of Science in Civil Engineering

GENERAL REQUIREMENTS
Total Credit Hours . . . . 126•
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.

	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**
FRESHMAN	ENGL **1113**, Prin. of English Composition (Core I)	3	ENGL **1213**, Prin. of English Composition (Core I), **or** EXPO **1213**, Expository Writing (Core I)		3
	*CHEM **1315**, General Chemistry (Core II)	5			
	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
			❖PHYS **2514**, General Physics for Engineering & Science Majors (Core II)		4
	CEES **1112**, Intro. to Civil Engr. & Environmental Science	2			
	ENGR **1410**, Freshman Engineering Orientation I	0			
	TOTAL CREDIT HOURS	**17**	**TOTAL CREDIT HOURS**		**16**
SOPHOMORE	❖MATH **2934**, Differential and Integral Calculus III	4	MATH **3113**, Introduction to Ordinary Differential Equations		3
	PHYS **2524**, General Physics for Engineering & Science Majors	4	§CEES **1000**, CEES Seminar		0
	§CEES **1000**, CEES Seminar	0	CEES **2153**, Mechanics of Materials		3
	CEES **2213**, CADD Fundamentals	3	CEES **2223**, Fluid Mechanics		3
	CEES **2113**, Statics	3	GEOL **1114**, Physical Geology for Science & Engr. Majors, **or** Basic Science		4
	HSCI **3333**, Technology and Society in World History (Core IV, West. Civ. & Culture) or approved substitute	3	ENGR **2002**, Professional Development		2
			P SC **1113**, American Federal Government (Core III)		3
	TOTAL CREDIT HOURS	**17**	**TOTAL CREDIT HOURS**		**18**
JUNIOR	§CEES **1000**, CEES Seminar	0	ENGL **3153**, Technical Writing		3
	CEES **3213**, Water Resources Engineering	3	§CEES **1000**, CEES Seminar		0
	CEES **3263**, Intro. Dynamics for Architectural & Civil Engineers	3	CEES **3243**, Water & Wastewater Treatment Design		3
	CEES **3363**, Soil Mechanics	3	CEES **3403**, Materials		3
	CEES **3361**, Soil Mechanics Lab	1	✦CEES **3663**, Structural Design—Steel I, **or** Professional Elective		3
	CEES **3413**, Structural Analysis I	3			
	ENGR **3401**, Engineering Economics	1	CEES **4253**, Statistics and Probability		3
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**		**15**
SENIOR	ANTH **4623**, Approaches to Cross-Cultural Human Problems or approved substitute (Core IV, Non-Western Civ.)	3	§CEES **1000**, CEES Seminar		0
			CEES **3883**, Transportation Engineering		3
	§CEES **1000**, CEES Seminar	0	CEES **4903**, Civil Engineering Design (Capstone)		3
	#Professional Elective	3	#Professional Elective		3
	✦CEES **3673**, Structural Design—Concrete I, or Professional Elective	3	†Approved Elective: Core III: Social Science		3
	CEES **4453**, Geomatics Engineering	3	†Approved Elective, Core IV: Artistic Forms		3
	CEES **4901**, Introduction to CE Capstone	1			
	CEES **4951**, Contemporary Topics in Prof. Practice	1			
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**		**15**

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.

• 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.

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

✦Students must take at least CEES 3663 or CEES 3673. Students may take both courses if desired.

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

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

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. (Sp)

2153 Mechanics of Materials. Prerequisites: 2113 or Aerospace and Mechanical Engineering 2113 or Petroleum Engineering 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 Aerospace and Mechanical Engineering 2113 or petroleum Engineering 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)

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. 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)

3263 Introduction to Dynamics for Architectural and Civil Engineers. Prerequisite: CEES 2153 and MATH 3113. Kinematics and kinetics of rigid bodies; free and forced vibrations of undamped and damped single degree-of-freedom systems; concept of mass, stiffness, and damping for typical structures; introduction to vibrations of two and more degrees-of-freedom systems; and determination of loads on structures from dynamic events such as earthquakes. (F)

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)

3403 Materials. Prerequisite: CEES 2153 or PE 2153 or concurrent enrollment. Study of the properties of materials utilized by architectural and civil engineers; analyses of aggregates, concrete, masonry, steel, asphalt, plastics and wood. **Laboratory** (Sp)

3413 Structural Analysis I. Prerequisite: CEES 2153 or PE 2153. Loads, reactions and force systems; introduction to design codes; analysis of frames and trusses; calculation of structural deformations; and analysis of indeterminate structures. Emphasis on classical solutions and time-tested approaches to structural engineering. Introduction to structural analysis computer programs to solve complex problems. (F)

3663 Structural Design – Steel I. Prerequisite: CEES 3413; and CEES 3403 or concurrent enrollment in CEES 3403. Design of steel structural members including tension elements, columns, beams, and beam-columns; bolted and welded connection design; composite beam design; introduction to plastic design. **Laboratory** (Sp)

3673 Structural Design – Concrete I. Prerequisite: 3403, 3413. Analysis and design of reinforced concrete beams, columns, slabs, footings, etc., along with discussion of current building practice. **Laboratory (F)**

3883 Transportation Engineering. Prerequisite: CEES 2153 or P E 2153 and CEES 3403. Introduction to transportation planning, design, construction, operations and maintenance emphasizing the highway/street mode. Includes demand modeling, route location and design, pavements including hot mix asphalt volumetrics and stability, drainage, and traffic control devices. (Sp)

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. (F)

4453 Geomatics Engineering. Prerequisites: CEES 2213, CEES 3403 and MATH 2433 or MATH 2934 or instructor permission. Geomatics engineering deals with the science of determining relative positions of features for mapping, engineering and construction plans. Topics include digital leveling, orientation, distance measurement, traversing and control surveys, accuracy, error sources, precise horizontal and zenith angle measurements, and introduction of global navigation satellite system. **Laboratory** (F)

4901 Introduction to CE Capstone. Prerequisites: Senior standing in Civil 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)

4903 Civil Engineering Capstone. Prerequisite: CEES 3213, CEES 3363, CEES 3361, CEES 3663 or CEES 3673 and CEES 4901. Solution of major design problems by a team approach of disciplines. Problems to be varied within the areas of civil engineering (structural; geotechnical; and transportation) according to the student's major interest. The capstone project will be under direct faculty supervision. (Sp) [V]

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)

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)

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 GEOLOGY (GEOL)

1114 Physical Geology for Science and Engineering Majors. Prerequisite: equivalent knowledge of high school chemistry, algebra and trigonometry. Laboratory included. Plate tectonics, the makeup of continents and mountain building. Heat flow, magnetism, gravity, rock deformation, earthquakes and the earth's interior. Surface processes including weathering, erosion, transport and deposition. Landforms, rivers, groundwater, glaciers, ocean processes, and volcanoes. Minerals and rocks. Application of geology to land-use, groundwater, mineral and fossil fuel exploration. **Laboratory** (F, Sp) [II-LAB]

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: 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)