## Required Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENGL 1113</td>
<td>Prin. of English Composition (Core I)</td>
<td>3</td>
<td>ENGL 1213</td>
<td>Prin. of English Composition (Core I), or</td>
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<tr>
<td>CHEM 1315</td>
<td>General Chemistry (Core II)</td>
<td>5</td>
<td>EXPO 1213</td>
<td>Expository Writing (Core I)</td>
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<td>MATH 2423</td>
<td>Calculus &amp; Analytic Geometry II (Core II)</td>
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<td>MATH 2423</td>
<td>Calculus &amp; Analytic Geometry II (Core I)</td>
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<td>CEES 2113</td>
<td>Statics and Dynamics</td>
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<td>CEES 2113</td>
<td>Statics and Manufacturing Processes</td>
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<td>ENGR 1410</td>
<td>Freshman Engineering Orientation I</td>
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<td>ENGR 1420</td>
<td>Freshman Engineering Orientation II</td>
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<td>MATH 2443</td>
<td>Calculus &amp; Analytic Geometry IV</td>
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<td>ENGR 1410</td>
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<tr>
<td>PHYS 2524</td>
<td>General Physics for Engineering &amp; Science Majors</td>
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<td>PHYS 2514</td>
<td>General Physics for Engineering &amp; Science Majors</td>
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<td>I E 2823</td>
<td>Enterprise Engineering</td>
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<td>I E 2311</td>
<td>Computer Aided Design &amp; Graphics Lab</td>
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<td>I E 3304</td>
<td>Design and Manufacturing II</td>
<td>4</td>
<td>I E 4223</td>
<td>Fundamentals of Engineering Economy</td>
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<td>I E 4533</td>
<td>Engineering Experimental Design</td>
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<td>I E 4563</td>
<td>Quality Engineering</td>
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<td>I E 4623</td>
<td>Systems Modeling and Optimization</td>
<td>3</td>
<td>I E 4633</td>
<td>Applied Engineering Optimization</td>
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<td>§MATH Elective</td>
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<td>I E 4824</td>
<td>Ergonomics</td>
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<td>§MATH Elective</td>
<td></td>
<td>3</td>
<td>§MATH Elective: Non-Western Culture (Core IV)</td>
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<tr>
<td>I E 4333</td>
<td>Production Systems and Operations</td>
<td>3</td>
<td>I E 4363</td>
<td>Facility Planning, Warehousing, and</td>
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<td>I E 4663</td>
<td>Systems Analysis Using Simulation</td>
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<td>I E 4593</td>
<td>Capstone Design Project (Capstone)</td>
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<td>ENGR 2431</td>
<td>Electrical Circuits</td>
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<td>ENGR 2461</td>
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<td>ENGR 3441</td>
<td>Fluid Mechanics</td>
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<td>§I E Elective</td>
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<td>§I E Elective</td>
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<td>3</td>
<td>§I E Elective: Western Civ. &amp; Culture (Core IV)</td>
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### Total Credit Hours

- **Year 1:** 14 credit hours
- **Year 2:** 16 credit hours
- **Year 3:** 16 credit hours
- **Year 4:** 16 credit hours

### Total Credit Hours

- **Freshman:** 14 credit hours
- **Sophomore:** 16 credit hours
- **Junior:** 16 credit hours
- **Senior:** 15 credit hours

### Notes

- 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.

- To be chosen from the approved list of math electives consisting of MATH 3113, 3333, 3413, 3513, 3613, 4433, or CS 1813.

- To be chosen from an approved list of IE electives available in the IE office, CEC 116.

- To be chosen from an approved list of IE technical electives available in the IE office, CEC 116.

- This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.
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 thermochernistry. Laboratory (F, Sp, Sui) [IR-LAB]

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)
2113 Statics and Dynamics. Prerequisites: Physics 2514 and Mathematics 2433 or concurrent enrollment. Vector representation of forces and moments; general three-dimensional theories 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)

2153 Mechanics of Materials. Prerequisites: 2113. Basic principles of mechanics, including the definition of stress and strain, spherical and cylindrical stress systems, equilibrium of volumes, stress 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)

COURSES IN COMPUTER SCIENCE (C S)
1323 Introduction to Computer Programming. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer software with an emphasis on abstraction and program organization. (F, Sp)

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 important issues and expectations of 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. 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)

1420 Freshman Engineering Orientation II. Prerequisite: declared major in engineering. All entering freshmen with a declared engineering major in this new first semester of this year-long course. One hour of this seminar a week is in a large group setting where all students meet and cover important issues and expectations of 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. (Sp)

2003 Engineering Practice I. Prerequisite: 1410, 1420, and English 1213. Introduction to basic principles of successful engineering enterprise. (F, Sp)

2431 Electrical Engineering I. Prerequisite: Mathematics 2423 and Physics 2524 or concurrent enrollment. Introduction to basic principles of electrical circuits. Topics include circuits (DC circuits, AC circuits, resonance, AC transients, DC transients) static electrical fields, static magnetic fields, and electronics (diodes, operational amplifiers). (F, Sp)

2461 Thermodynamics. Prerequisite: Mathematics 2433 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 psychrometrics. (F)

3441 Fluid Mechanics. Prerequisite: Mathematics 2433. Introduction to basic principles of fluid mechanics. Topics include fluid properties, fluid statics, dimensional parameters and similitude, control volume equations, open channel flow, and external flow. (F)

COURSES IN INDUSTRIAL ENGINEERING (I E)
2303 Materials, Design and Manufacturing Processes (Crosslisted with Aerospace and Mechanical Engineering 2303). Prerequisites: Aerospace and Mechanical Engineering 2113 or Civil Engineering and Environmental Science 2113 or Engineering 2113. Mechanical and physical properties of engineering materials. Introduction to design concepts, manufacturing processes and equipment used in manufacturing. (F, Sp)

2311 Computer Aided Design and Graphics Laboratory for Industrial Engineers. Corequisite: 2303. Provides students with a basic understanding of technical graphics communication and computer-aided design for industrial engineering applications. By using computer-aided design/ drafting software, SolidWorks/AutoCAD, students will learn basic principles of engineering graphics and geometric modeling to assist in design problem visualization and planning. (F)

2823 Enterprise Engineering. Prerequisite: sophomore standing. Introduction to the industrial engineering role as enterprise system integrator. Systems concepts, modeling and analysis; integrated product/service and operational process design; productivity and quality improvement; computer technology insertion; project, operations, and global supply chain management. (F)

1G3293 Applied Engineering Statistics. Prerequisite: Mathematics 2433. Introduction to probability, statistical inference, hypothesis testing, correlation and regression, sampling distributions, point estimation, confidence intervals, and applications of the normal and t distributions. (F, Sp, Sui) [IR-LAB]

1G3343 and Manufacturing II. Prerequisite: 2303, 2113, Civil Engineering and Environmental Science 2113 or one of Aerospace and Mechanical Engineering 2303 or 3143 (or concurrent enrollment). Dimensioning and tolerancing; tolerances—type, design and specification; assembly and fit design; tolerance standards; process planning—predence representation in machining, operation and machine sequencing; jigs and fixtures—design and analysis; time and motion study for machining; automation; processes/system integration. Laboratory (F, Sp, Sui) [IR-LAB]

G4223 Fundamentals of Engineering Economy. Prerequisite: Mathematics 2423. Introduction to concepts of economic analysis to optimize benefits utilizing multivariable, multistaged mathematical models. Topics include cost and worth comparison, capital costs and sources, time value of money, revenue generation economics, taxes, economic efficiency of alternate designs, minimum costs and maximum benefits, risk and uncertainty and economics of work schedules. (Sp)

G4333 Production Systems and Operations. Prerequisites: 2823 and 4623, or by permission. Operations-oriented topics for production systems. Supply chain process (tactical planning, operational scheduling and sequencing, management and planning, demand promising). Customer service process; E-Business and information technology applications for production systems. (F)

4363 Facility Planning, Warehousing, and Material Handling (Crosslisted with 5363). Prerequisite: 4623. Facility location and layout models, design, analysis, and improvement of warehousing operations, material handling systems in manufacturing and warehousing operations, information technologies for management of operations, supply chain relationships. No student may earn credit for both 4363 and 5363. (Sp)

4393 Capstone Design Project. Prerequisite: 4333, 4563, 4663, and 4853. Restricted to graduating industrial engineering students; to be taken in the last semester. Current problems drawn from production and service organizations will be presented by personnel from these organizations. Students will solve these problems under the guidance of their instructor, using industrial engineering methodology. (Sp) [IV]

4533 Engineering Experimental Design (Crosslisted with 5553). Prerequisite: 1293 or Engineering 1293. Fundamentals of design of experiments. Analysis of variance models for single factor experiments with blocking factors and multi-factor designs, including factorial and nested designs. Fixed, random and mixed models. Analysis of covariance models. No student may earn credit for both 4553 and 5553. (F)

4563 Quality Engineering (Crosslisted with 5563). Prerequisite: 3293 or Engineering 3293, and 4553 or 5553. Statistical methods for quality characteristics and improvement of product and process environments for engineering and management utilization. Focus will be on statistical process control tools and total quality management. No student may earn credit for both 4563 and 5563. (Sp)

4622 Systems Modeling and Optimization. Prerequisite: 2823. Problem solving using analytical models. Introduction to optimization, linear programming, integer, dynamic programming, and goal programming methods. Simplex method and sensitivity analysis. Practical applications using optimization software such as LINDO, LINGO, EXCEL SOLVER. Analytical decision making. (F)

4633 Applied Engineering Optimization. Prerequisite: 3293 or 3293, 4623. Data mining techniques, heuristics and applications of operations research to financial engineering, site selection, transportation, transhipment and assignment problems. Routing techniques, facility layout models, queuing models and applications, Monte Carlo simulations and applications. (Sp)

4663 Systems Analysis Using Simulation. Prerequisite: Engineering 3293 or 3293, 4633. Implements the science of systems analysis through the use of simulation modeling and statistical analysis; inclusive of time study analysis for performing input modeling tasks. Laboratory (F)

1G46824 Ergonomics. Prerequisite: junior standing or permission of instructor. The measurement of human physical capabilities and limitations. Measurement of the environment and elicited human responses. Workplace, equipment and job design with regard to human performance efficiency, health, and safety. Laboratory (Sp)

4853 Applied Research Methods (Crosslisted with 5853). Prerequisite: 4533 and 4824. Experimental methodology for empirical investigation, including problem formulation. The development and measurement of performance criteria, experimental and oral communication. The measurement of human performance is typically the vehicle used for students in this course. No student may earn credit for both 4853 and 5853. (F)

COURSES IN MATHEMATICS (MATH)
1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the placement test, or 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 1741. (F, Sp, Sui) [IL-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 2132. (F, Sp, Sui) [IL-M]

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

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, Sui)

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, Sui) [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, Sui)