REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING

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

COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2010 through Spring 2011

GENERAL REQUIREMENTS

Total Credit Hours · **131•**
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.

Industrial Engineering:
Information Technology
B526
Bachelor of Science in Industrial Engineering

OU encourages students to complete at least 33 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**	3
	CHEM 1315, General Chemistry (Core II)	5	**EXPO 1213**, Expository Writing (Core I)	
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	**MATH 2423**, Calculus & Analytic Geometry II (Core I)	3
	P SC 1113, American Federal Government (Core III)	3	**HIST 1483**, U.S., 1492-1865, **or**	3
	ENGR 1411, Freshman Engineering Experience	1	**1493**, U.S., 1865-Present (Core IV)	
	†Approved Elective: Artistic Forms (Core IV)	3	**PHYS 2514**, General Physics for Engineering & Science Majors (Core II)	4
			***C S 1323,** Introduction to Computer Programming	3
	TOTAL CREDIT HOURS	**18**	**TOTAL CREDIT HOURS**	**16**
SOPHOMORE	**MATH 2433**, Calculus & Analytic Geometry III	3	**CEES 2153**, Mechanics of Materials	3
	PHYS 2524, General Physics for Engineering & Science Majors	4	**I E 2303**, Design & Manufacturing Processes	3
			I E 2311, Computer Aided Design & Graphics Lab	1
	CEES 2113, Statics and Dynamics	3	**I E 3293**, Applied Engineering Statistics	3
	ENGR 2002, Professional Development	2	**C S 2334,** Programming Structures & Abstractions	4
	I E 2823, Enterprise Engineering	3	**MATH 2513**, Discrete Mathematical Structures	3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**17**
JUNIOR	**MATH 2443**, Calculus & Analytic Geometry IV	3	**I E 4223**, Fundamentals of Engineering Economy	3
	I E 3304, Design and Manufacturing II	4	**I E 4563**, Quality Engineering	3
	I E 4553, Engineering Experimental Design	3	**I E 4633**, Applied Engineering Optimization	3
	I E 4623, Systems Modeling and Optimization	3	**I E 4824**, Ergonomics	4
	C S 2413, Data Structures	3	**‡C S** Elective	3
	TOTAL CREDIT HOURS	**16**	**TOTAL CREDIT HOURS**	**16**
SENIOR	**I E 4333**, Production Systems and Operations	3	**I E 4363**, Facility Planning, Warehousing, and Material Handling	3
	I E 4663, Systems Analysis Using Simulation	3		
	I E 4853, Applied Research Methods	3	**I E 4393**, Capstone Design Project (Capstone)	3
	ENGR 2431, Electrical Circuits	1	**‡C S** Elective	3
	ENGR 2461, Thermodynamics	1		
	ENGR 3441, Fluid Mechanics	1	†Approved Elective: Non-Western Culture (Core IV)	3
	‡C S Elective	3	†Approved Elective: Western Civ. & Culture (Core IV)	3
	†Approved Elective: Social Science (Core III)	3		
	TOTAL CREDIT HOURS	**18**	**TOTAL CREDIT HOURS**	**15**

NOTE: Engineering transfer students may take ENGR 3511 in place of ENGR 1411.

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 C S Elective list available in the I E 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 thermochemistry. **Laboratory** (F, Sp, Su) [II-LAB]

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

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; centoids 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 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)

COURSES IN COMPUTER SCIENCE (C S)

1323 Introduction to Computer Programming. Prerequisite: Mathematics 1523 or concurrent enrollment. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

2334 Programming Structures and Abstractions. Prerequisite: 1323 and Mathematics 1823. Application of software engineering principles with examples from central areas of computer science. Use of abstract data types such as stacks, queues, lists, trees, file processing. Introduction to ethics in computer science, including philosophical ethics theories. Discussion of intellectual property rights and privacy. A program design tool will be used. (F, Sp)

2413 Data Structures. Prerequisite: 2334 and 2813 or 1813 or Mathematics 2513, or concurrent enrollment in 2813 or Mathematics 2513. Representation, analysis and implementation of widely used data structures and associated algorithms. Discussion of algorithms employing data structures with analysis. Written communications required in some projects. Discussion of ethical issues including computer crime, abuse, and hacker ethics. Tools and techniques used in writing secure applications will also be discussed. Windows operating system will be used. A debugging tool will be used. (F, Sp)

COURSES IN ENGINEERING (ENGR)

1411 Freshman Engineering Experience. Prerequisite: declared major in Engineering or permission of instructor. Required of all entering freshmen with a declared Engineering major. Lecture hours cover a variety of topics including: majors and minors; career planning; advising; and extra-curricular activities. Students also work on multi-disciplinary engineering projects in smaller groups during the lab hour. (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)

2431 Electrical Circuits. 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 psychometrics. (F)

3441 Fluid Mechanics. Prerequisite: Mathematics 2433. Introduction to basic principles of fluid mechanics. Topics include fluid properties, fluid statics, dimensionless 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). Prerequisite: 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 engineering. (Sp)

2311 Computer Aided Design and Graphics Laboratory for Industrial Engineers. Corequisite: 2303. Provides students with a basic understanding of technical graphics communication and cumpter-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. (Sp)

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)

†G3293 Applied Engineering Statistics. Prerequisite: Mathematics 2433. Introduction to probability, one and higher dimensional random variates, function of random variables, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, use of statistical packages. Not available for graduate credit for students in engineering disciplines. (F, Sp, Su)

†G3304 Design and Manufacturing II. Prerequisite: 2303, 2311, Civil Engineering and Environmental Science 2153 (or concurrent enrollment) or Aerospace and Mechanical Engineering 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 cost estimation for machining; automation; processes/system integration. **Laboratory** (F)

G4223 Fundamentals of Engineering Economy. Prerequisite: Mathematics 2423. Introduction to concepts of economic analysis to optimize benefits utilizing multivariant, multistaged mathematical models. Topics include cost and worth comparison, capital costs and sources, time value of money, replacement 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. Prerequisite: 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 (Slashlisted with 5363). Prerequisite: 4623. Facility location and layout models, design, analysis, and improvement of warehousing operations, material handling systems in manufacturing and warehousing operations, informational 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) [V]

4553 Engineering Experimental Design (Slashlisted with 5553). Prerequisite: 3293 or Engineering 3293. Fundamentals of design of experiments. Analysis of variance models for single factor designs 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 (Slashlisted with 5563). Prerequisite: 3293 or Engineering 3293, and 4553. The use of statistical methods for quality control and improvement in product and non-product 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)

4623 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. Introduction to stochastic programming. (F)

4633 Applied Engineering Optimization. Prerequisite: Engineering 3293 or 3293, 4623. Data mining techniques, heuristics and applications of operations research to financial engineering, site selection, transportation, transshipment and assignment problems. Routing techniques, facility layout models, queueing 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)

†G4824 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 (Slashlisted with 5853). Prerequisite: 4553 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, 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)

2513 Discrete Mathematical Structures. Prerequisite: 2423 or concurrent enrollment. A course for math majors or prospective math majors. Provides an introduction to discrete concepts such as finite sets and structures, and their properties and applications. Also exposes students to the basic procedures and styles of mathematical proof. Topics include basic set theory, functions, integers, symbolic logic, predicate calculus, induction, counting techniques, graphs and trees. Other topics from combinatorics, probability, relations, Boolean algebras or automata theory may be covered as time permits. (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. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)