### GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>Year</th>
<th>FIRST SEMESTER</th>
<th>Hours</th>
<th>SECOND SEMESTER</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRESHMAN</td>
<td>ENGL 1113, Prin. of English Composition (Core I)</td>
<td>3</td>
<td>ENGL 1213, Prin. of English Composition (Core I), or</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CHEM 1315, General Chemistry (Core II)</td>
<td>5</td>
<td>CHEM 1213, Expository Writing (Core I)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>MATH 1823, Calculus &amp; Analytic Geometry I (Core I)</td>
<td>3</td>
<td>MATH 2423, Calculus &amp; Analytic Geometry II (Core I)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PSC 1113, American Federal Government (Core III)</td>
<td>3</td>
<td>HIST 1483, U.S., 1492-1865, or</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ENGR 1411, Freshman Engineering Experience</td>
<td>1</td>
<td>HIST 1493, U.S., 1865-Present (Core IV)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>PHYS 2511, General Physics for Engineering &amp; Science Majors</td>
<td>3</td>
<td>PHYS 2514, General Physics for Eng. &amp; Science Majors (Core II)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>C S 1323, Fundamentals of Computer Programming, or</td>
<td>3</td>
<td>C S 1323, Fundamentals of Computer Programming, or</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>MATH 5000-6000-Level Grad. Elective</td>
<td>3</td>
<td>MATH 5000-6000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 2823, Enterprise Engineering</td>
<td>3</td>
<td>ISE 2823, Enterprise Engineering</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL CREDIT HOURS</td>
<td>15</td>
<td>TOTAL CREDIT HOURS</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

**Sophomore**

<table>
<thead>
<tr>
<th>Year</th>
<th>FIRST SEMESTER</th>
<th>Hours</th>
<th>SECOND SEMESTER</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MATH 2443, Calculus &amp; Analytic Geometry IV</td>
<td>3</td>
<td>ISE 4223, Fundamentals of Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 3304, Design and Manufacturing II</td>
<td>4</td>
<td>ISE 4563, Quality and Reliability Engineering</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 4113, Spreadsheet-Based Decision Support Systems</td>
<td>3</td>
<td>ISE 4633, Probabilistic Systems Models</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 4533, Data-Driven Decision Making I</td>
<td>3</td>
<td>ISE 4804, Ergonomics in Systems Design</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ISE 4623, Deterministic Systems Models</td>
<td>3</td>
<td>ENGR 2431, Electrical Circuits</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>C S 1323, Fundamentals of Computer Programming, or</td>
<td>3</td>
<td>ENGR 2461, Thermodynamics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MATH 5000-6000-Level Grad. Elective</td>
<td>3</td>
<td>ENGR 3441, Fluid Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL CREDIT HOURS</td>
<td>15</td>
<td>TOTAL CREDIT HOURS</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

**Junior**

<table>
<thead>
<tr>
<th>Year</th>
<th>FIRST SEMESTER</th>
<th>Hours</th>
<th>SECOND SEMESTER</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 4333, Production Systems and Operations</td>
<td>3</td>
<td>ISE 4393, Capstone Design Project (Capstone)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 4663, Systems Analysis Using Simulation</td>
<td>3</td>
<td>ISE 5000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>*ISE 5383, Systems Evaluation</td>
<td>3</td>
<td>*ISE 5000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>*ISE 5853, Data-Driven Decision Making II</td>
<td>3</td>
<td>*ISE 5000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>*ISE 5000-level Grad. Elective</td>
<td>3</td>
<td>*ISE 5000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL CREDIT HOURS</td>
<td>15</td>
<td>TOTAL CREDIT HOURS</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Senior**

<table>
<thead>
<tr>
<th>Year</th>
<th>FIRST SEMESTER</th>
<th>Hours</th>
<th>SECOND SEMESTER</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISE 5000-Level Grad. Elective</td>
<td>3</td>
<td>ISE 5980, Thesis Research</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 5000-6000-Level Grad. Elective</td>
<td>3</td>
<td>ISE 5000-6000-Level Grad. Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ISE 5980, Thesis Research</td>
<td>3</td>
<td>ISE 5980, Thesis Research</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL CREDIT HOURS</td>
<td>9</td>
<td>TOTAL CREDIT HOURS</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

### REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING/MASTER OF SCIENCE

The University of Oklahoma

OU encourages students to complete at least 29 hours of applicable coursework each year to have the opportunity to graduate in five years.

**General Requirements**

- **Total Credit Hours**: 
  - 15
  - 16

**First Semester**

- **Total Credit Hours**: 
  - 6

**Second Semester**

- **Total Credit Hours**: 
  - 6

**Sophomore**

- **Total Credit Hours**: 
  - 15

**Junior**

- **Total Credit Hours**: 
  - 16

**Senior**

- **Total Credit Hours**: 
  - 16

**Fifth Year**

- **Total Credit Hours**: 
  - 9

*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.*

**General Requirements**

- **Total Credit Hours**: 
  - 142

**Minimum Retention/Graduation Grade Point Averages**

- **Overall - Combined and OU**: 
  - 3.00

**Curriculum - Combined and OU**: 

- **Major - Combined and OU**: 
  - 3.00

**A minimum grade of C is required for each course in the curriculum.**

**Obtaining a Bachelor of Science in Industrial Engineering/Minor of Science**

**To be chosen from an approved list of IE electives that carry graduate credit available in the IE office, CEC 116.**

**To be chosen from an approved list of IE electives that carry graduate credit available in the IE office, CEC 116.**

**Must be approved by the Thesis Committee in accordance with current Master of Science requirements available in the IE office, CEC 116.**

**These courses are dual-counted, fulfilling requirements for both the undergraduate and graduate Industrial Engineering degrees.**
Industrial Engineering-BS/MS—A525/F525—Page 2

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 thermochromy. 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 2413 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; 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. Basic principles of elasticity. Physical interpretation of 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 (CS)
1311 Programming for Nonmajors. Prerequisite: Mathematics 1523 or concurrent enrollment. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

1323 Introduction to Computer Programming, Prerequisite: MATH 1523 or placement into MATH 1743 or, if MATH 1823 is a corequisite. Introduction to the design and implementation of computer programs with an emphasis on abstraction and program organization. (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, laboratory, and computer laboratory cover the history, present and future of topics integral to industrial engineering applications. By using computer-aided design software, students will learn basic principles of engineering graphics and geometric modeling to assist in design problem visualization and planning. (Sp)

2002 Professional Development. Prerequisite: sophomore standing. Develop an understanding of professional ethics and engineering management and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

2431 Electrical Circuits. Prerequisites: Mathematics 2423 and Physics 2524 or concurrent enrollment. Introduction to basic principles of electrical circuits. Topics include DC circuits, AC circuits, transistors, operational amplifiers, state variables, state equations, electronic devices, and semiconductors. (F, Sp)

2461 Thermodynamics. Prerequisites: 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, Sp)

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 AND SYSTEMS ENGINEERING (ISE)
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 materials in relation to their integration 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 communications and CAD software. Topics to include: computer-aided design (CAD) software, 3D modeling, solid modeling, parametric design, design optimization, and other computer-aided design (CAD) software. Students will learn the basic principles of engineering graphics and geometric modeling to assist in design problem visualization and planning. (Sp)

2401 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, Sp)

2493 Applied Engineering Statistics. Prerequisite: Mathematics 2433. Introduction to probability, one and higher dimensional random variables, function of random variables, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, and hypothesis testing. Not available for graduate credit for students in engineering disciplines. (F, Sp, Su)

G3044 Design and Manufacturing II. Prerequisite: 2303, 2311, Civil Engineering and Environmental Science 2113 or concurrent enrollment. (F, Sp, Su) [III-LAB]

4113 Spreadsheet-Based Decision Support Systems. Prerequisite: IE 4623 or concurrent enrollment in E 4623, Computer Science 1313 or C 3321, or permission of instructor. Covers all aspects of spreadsheet-based software functionality that are relevant to supporting decision-making. Microsoft Excel is used as the subject tool. Students will learn advanced functions of Excel that are available through the spreadsheet interface; the Visual Basic language and its integration with the spreadsheet environment, principles of decision-support systems studied in a variety of applications, integration of spreadsheet application with a spreadsheet environment; and use of effective spreadsheets for complex decision problems. (F)

G4223 Fundamentals of Engineering Economy. Prerequisite: Mathematics 2423. Introduction to concepts of economic analysis to optimize benefits utilizing multivariable, multistaged mathematical modeling techniques. Topics include depreciation, replacement economics, taxes, economic efficiency of alternate designs, minimum costs and maximum benefits, risk and uncertainty and economics of work schedules. (Sp)

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

4393 Capstone Design Project. Prerequisites: 4333, 4563, 4663, and 4833. Restricted to graduating industrial engineering students; to be taken in the last semester. Current problems and issues of production and service organizations will be presented from the viewpoints of students in the organization. Students will solve these problems under the guidance of their instructor, using industrial engineering methodology. (F, Sp)

4553 Data-Driven Decision Making I (Slashlisted with 5553). Prerequisite: 3923. Fundamentals of statistical models for describing engineering systems and processes. Analysis of variance, multiple regression, logistic regression, time series, clustering. Emphasis is placed on decision making. No student may earn credit for both 4553 and 5553. (F)

4563 Quality and Reliability Engineering (Slashlisted with 5563). Prerequisites: 3923, and 4553 or 5553. The use of statistical methods for quality control and improvement in product and process environments, as well as introductory applied probability for component and system reliability. Topics include philosophies of quality management, control chart theory and application, process capability, and performance metrics of reliability. Focus is given to decision making in engineering systems. No student may earn credit for both 4563 and 5563. (Sp)

4623 Deterministic Systems Models. Prerequisite: 2823. Problem solving using analytical models: theory, methodology, and application. Topics include linear programming, simplex algorithm and sensitivity analysis, integer programming, and dynamic programming. Practical applications in transportation networks, project management and scheduling, deterministic inventory models, decision making under certainty and uncertainty. Solution methods using computer software. (Sp)


4663 Systems Analysis Using Simulation. Prerequisite: Engineering 3923 or 3923, 4623. Implements the science of systems analysis through the use of simulation modeling and statistical techniques, applied towards the design and analysis of complex systems. Laboratory (F)

4804 Ergonomics in Systems Design. 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)

G5383 Systems Evaluation (Slashlisted with 4383). Prerequisite: permission of department. Focuses on the development and evaluation of alternate systems and process designs. Development of system goals, requirements, and performance measures; ranking of alternatives and decision analysis techniques. Review and development of trade studies. Applications in facility layout, production, supply chain, and other contexts. No student may earn credit for both 4383 and 5383. (F)

G5853 Data-Driven Decision Making II (Slashlisted with 4853). Prerequisite: 4553 and 4804. Experimental methodology for empirical decision making. Includes the development and measurement of empirical hypotheses, design, performance criteria, and analyses. The measurement of human performance and its integration with the vehicle used for students in this course. No student may earn credit for both 4853 and 5853. (Sp)

G5908 Research for Master’s Thesis. Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

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-III]

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-III]

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, and directional derivatives of multivariate functions; multiple integrals; line and surface integrals. (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 1503 or concurrent enrollment in 1215. Temperature, heat, life, electric and magnetic fields, magnetism, optics. (F, Sp, Su)