## 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><strong>FRESHMAN</strong></td>
<td><strong>ENGL</strong></td>
<td>1113, Prin. of English Composition (Core I)</td>
<td>3</td>
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<tr>
<td></td>
<td><strong>CHEM</strong></td>
<td>1315, General Chemistry (Core II)</td>
<td>5</td>
<td><strong>EXPO</strong></td>
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<tr>
<td></td>
<td><strong>MATH</strong></td>
<td>1914, Differential &amp; Integral Calculus I (Core I)</td>
<td>4</td>
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<td></td>
<td><strong>PSC</strong></td>
<td>1113, American Federal Government (Core III)</td>
<td>3</td>
<td><strong>HIST</strong></td>
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<tr>
<td></td>
<td><strong>ENGR</strong></td>
<td>1411, Freshman Engineering Experience</td>
<td>1</td>
<td><strong>PHYS</strong></td>
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<td><strong>C S</strong></td>
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<tr>
<td><strong>SOPHOMORE</strong></td>
<td><strong>MATH</strong></td>
<td>2934, Differential &amp; Integral Calculus III</td>
<td>4</td>
<td><strong>CEES</strong></td>
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<td></td>
<td><strong>C S</strong></td>
<td>2334, Programming Structures &amp; Abstractions</td>
<td>4</td>
<td><strong>ISE</strong></td>
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<td><strong>CEES</strong></td>
<td>2113, Statics</td>
<td>3</td>
<td><strong>ISE</strong></td>
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<td><strong>ISE</strong></td>
<td>2823, Enterprise Engineering</td>
<td>3</td>
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<td></td>
<td><strong>PHYS</strong></td>
<td>2524, General Physics for Engineering &amp; Science Majors</td>
<td>4</td>
<td><strong>C S</strong></td>
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<td><strong>MATH</strong></td>
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<td><strong>JUNIOR</strong></td>
<td><strong>ISE</strong></td>
<td>3304, Design and Manufacturing II</td>
<td>4</td>
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<td><strong>ISE</strong></td>
<td>4113, Spreadsheet-Based Decision Support Systems</td>
<td>3</td>
<td><strong>ISE</strong></td>
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<td></td>
<td><strong>ISE</strong></td>
<td>4553, Data-Driven Decision Making I</td>
<td>3</td>
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<td><strong>ISE</strong></td>
<td>4623, Deterministic Systems Models</td>
<td>3</td>
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<td><strong>C S</strong></td>
<td>3202, Software Requirements and Specifications</td>
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<td><strong>SENIOR</strong></td>
<td><strong>ISE</strong></td>
<td>4333, Production Systems and Operations</td>
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<td><strong>ISE</strong></td>
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<td></td>
<td><strong>ISE</strong></td>
<td>4383, Systems Evaluation</td>
<td>3</td>
<td><strong>ISE</strong></td>
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<tr>
<td></td>
<td><strong>ISE</strong></td>
<td>4663, Systems Analysis Using Simulation</td>
<td>3</td>
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<td></td>
<td><strong>ISE</strong></td>
<td>4853, Data-Driven Decision Making II</td>
<td>3</td>
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<tr>
<td></td>
<td><strong>C S</strong></td>
<td>4513 or other C S Elective</td>
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<tr>
<td></td>
<td><strong>ENGR</strong></td>
<td>2431, Electrical Circuits</td>
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**TOTAL CREDIT HOURS**
- **FRESHMAN**: 16
- **SOPHOMORE**: 18
- **JUNIOR**: 15
- **SENIOR**: 16
- **Overall**: 66

**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 ISE office, CEC 116.

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

* CHEM 1315 can be substituted with CHEM 1335 (Fall only).
4113 Spreadsheet-Based Decision Support Systems. Prerequisite: ISE 4623 or concurrent enrollment in ISE 4623, Computer Science 3133 or CSE 3522, 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, and special purpose software integration tools and methods used in support of engineering decision making. (Sp)

G4223 Fundamentals of Engineering Economy. Prerequisite: MATH 2423 or 2924 or permission of instructor. Development and use of economic analysis techniques for design considerations and bond problems. Bases for comparison of alternatives, present worth, annual worth, rate of return and savings-investment ratio methods. Decision-making among independent, dependent, capital-constrained and unequal-lived projects. Depreciation methods and their effect on corporate income taxes, leading to after-tax cash flow analysis. Benefit-cost and cost effectiveness analysis. (Sp)

G4333 Production Systems/Operation. 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 performance requirements. Operations simulation and inventory and technology applications for production systems. (F)

4383 Systems Evaluation. Prerequisite: I E 1 E 3304, I E 4223, I E 4563, I E 4563, I E 4563, I E 4804. Focus on the development and evaluation of alternate system and process designs. Design of system goals, requirements, and performance measures; ranking of alternatives and decision analysis techniques. Review and development of trade studies. Applications in facility layout, maintenance, supply chain, and other contexts. (F)

4393 Capstone Design Project. Prerequisite: I E 4333, I E 4383, I E 4663, and I E 4853. Restricted to graduating industrial and systems engineering students; to be taken in the last semester. Current projects 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. (F,Sp) [V]

4553 Data-Driven Decision Making I (Slashlisted with 5553). Prerequisite: I E 3293. Fundamentals of data driven decision making emphasizing descriptive and predictive data analysis processes. Analysis of variance, multiple regression, logistic regression, time series, clustering, Empirical models, phase portraits. No student may earn credit for both 4553 and 5553. (F)

4563 Quality & Reliability Engineering (Slashlisted with 5563). Prerequisite: I E 3293 and I E 4553. The use of statistical methods for quality control and improvement in product and process environments, as well as introductory foundational topics for probability, reliability 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)

4635 Probabilistic Systems Models. Prerequisite: I E 3293 or I E 3293 AND I E 4623 or I E 4623. Problem solving using analytical models: theory, methodology, and application. Topics include linear programming, simple algorithm and sensitivity analysis, integer programming, and dynamic programming. Practical applications in transportation networks, project management and scheduling, deterministic inventory models, decision making, and systems integration. Solution methods using computer software. (F)

2533 Probabilistic Systems Models. I E 3293 or I E 3293 AND I E 4623 or I E 4623. Problem solving using stochastic models: theory, methodology, and application. Topics include probability and discrete decision processes, queues and Markov decision processes, queuing theory, and Monte Carlo simulation. Practical applications in probabilistic inventory models, maintenance activities, decision making, and systems integration. Solution methods using computer software. (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 series analysis for performing input modeling tasks. Laboratory (F)

4804 Ergonomics in Systems Design. Prerequisite: junior standing or permission of instructor. Human-systems integration, considering the impacts of the physical structure, the information flow, the human interface, and the cognitive and psychological conditions on human performance. Students learn how to design, evaluate, and improve systems from the perspective of the human(s) working in and impacted by the system. (Sp)

4853 Data-Driven Decision Making II (Slashlisted with 5853). Prerequisite: 4553 and 4804. Experimental methodology for empirical decision making. Includes the development of empirical human computer interaction design, and empirical data analysis processes. Techniques for empirical reporting. 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)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the math assessment. Dual registration with a minimum of MATH 1823 and CSE 2242 and concurrent enrollment for full credit. First semester of a two-semester sequence. Topics include 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) [J-M]

2934 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Dual registration with a minimum of MATH 2423 and MATH 2424. The natural logarithmic and exponential functions, inverse trigonometric functions, integration techniques, applications of integration, improper integrals, polar coordinates, infinite sequences and series. (F, Sp, Su) [J-M]

2934 Differential and Integral Calculus III. Prerequisite: 2924 with grade of C or better. Dual registration with a minimum of MATH 2423 and MATH 2424. Multivariable partial differential equations, vectors and vector fields, integration along curves and surfaces, theorems of Green-Gauss and Stokes. (F, Sp, Su)

2513 Discrete Mathematical Structures. Prerequisite: MATH 2423 or MATH 2924 or concurrent enrollment in MATH 2423 or MATH 2924. Introduction to discrete structures 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, combinatorics and discrete 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 1814 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, rotational work and energy, oscillations and wave interference. (F, Su) [J-N]

2524 General Physics for Engineering and Science Majors. Prerequisite: PHYS 2514 and MATH 2423 or MATH 2924 with grade of C or better. Not open to students with credit in PHYS 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

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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. Topics include units of measure, stoichiometry, thermodynamics, and kinetic theory. (F, Sp, Su) [I-LAB]

2113 Statics. Prerequisite: MATH 2423 or MATH 2924 or concurrent enrollment in MATH 2423 or MATH 2924. Vector representation of forces and moments; general three-dimensional systems 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 forces in solid objects. Analysis of mechanisms and primary machines. (F, Sp, Su)

1523 or concurrent enrollment or placement into MATH 1743 or MATH 1823 or higher and concurrent enrollment. Mechanical and physical properties of engineering materials. Introduction to design concepts, manufacturing processes and equipment used in the manufacture of bulk materials. (F, Sp, Su) (Crosslisted with AME 2303)

Differential and Integral Calculus III. Prerequisite: MATH 2423 or MATH 2924 with grade of C or better. Not open to students with credit in PHYS 1215. Fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas and volumes, second law of thermodynamics, and psychometrics. (F)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the math assessment. Dual registration with a minimum of MATH 1823 and CSE 2242 and concurrent enrollment for full credit. First semester of a two-semester sequence. Topics include 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) [J-M]

2934 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Dual registration with a minimum of MATH 2423 and two hours of 2423. The natural logarithmic and exponential functions, inverse trigonometric functions, integration techniques, applications of integration, improper integrals, polar coordinates, infinite sequences and series, vectors in two and three dimensions. (F, Sp, Su) [J-M]

2934 Differential and Integral Calculus III. Prerequisite: 2924 with grade of C or better. Dual registration with a minimum of MATH 2423 and two hours of 2423. The fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas and volumes. (F, Sp, Su) [J-M]

2513 Discrete Mathematical Structures. Prerequisite: MATH 2423 or MATH 2924 or concurrent enrollment in MATH 2423 or MATH 2924. Introduction to discrete structures 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, combinatorics and discrete probability, relations, Boolean algebras or automata theory. May be covered as time permits. (F, Sp, Su)