for the degree of Bachelor of Science in Systems Engineering and Design (formerly General Engineering)

department website: https://ise.illinois.edu/
department faculty: Industrial & Enterprise Systems Faculty (https://ise.illinois.edu/directory/faculty.html)
overview of college admissions & requirements: The Grainger College of Engineering (https://grainger.illinois.edu/admissions)
college website: https://grainger.illinois.edu/

Systems Engineering and Design (SED) is a comprehensive, interdisciplinary program emphasizing interactions between parts of a whole. It brings together basic sciences, engineering analysis, and engineering design. The curriculum offers flexibility through a Secondary Field Option, while providing a broad background in engineering as a whole and decision-making that supports overall design. Systems Engineers understand how to coordinate interacting parts of a whole and to evaluate engineering within economic and physical constraints.

Design experience and project management are emphasized and integrated across the core with a focus on establishing critical problem-solving skills applied across disciplines, strong communication skills, and the ability to work effectively and get results in a team environment.

The capstone experience for Systems Engineering and Design undergraduates is the Senior Project Course. Students work collaboratively with industry and a team of faculty members on a real-world problem during their final semester. The results are documented in a final written report and a formal presentation at the end of the semester to the company so that the student recommendations may be implemented.

Orientation and Professional Development
These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Foundational Mathematics and Science
These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Systems Engineering and Design Technical Core
These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of systems engineering and design.

Overview of Curricular Requirements
The curriculum requires 128 hours for graduation and is organized as shown below.

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<thead>
<tr>
<th>Code</th>
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<td>Engineering Orientation</td>
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<td>SE 100</td>
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<td>CHEM 102</td>
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<td>General Chemistry Lab I</td>
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<td>Calculus I</td>
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<td>MATH 241</td>
<td>Calculus III</td>
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<tr>
<td>MATH 285</td>
<td>Intro Differential Equations</td>
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<td>MATH 415</td>
<td>Applied Linear Algebra</td>
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<td>PHYS 211</td>
<td>University Physics: Mechanics</td>
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<tr>
<td>PHYS 212</td>
<td>University Physics: Elec &amp; Mag</td>
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<td>PHYS 213</td>
<td>Univ Physics: Thermal Physics</td>
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<td>CS 101</td>
<td>Intro Computing: Engrg &amp; Sci</td>
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<tr>
<td>ECE 110</td>
<td>Introduction to Electronics</td>
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<tr>
<td>ECE 211</td>
<td>Analog Circuits &amp; Systems</td>
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<td>SE 261</td>
<td>Business Side of Engineering</td>
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<tr>
<td>SE 310</td>
<td>Design of Structures and Mechanisms</td>
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<td>SE 311</td>
<td>Engineering Design Analysis</td>
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<td>Instrumentation and Test Lab</td>
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<td>Control Systems</td>
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<tr>
<td>SE 424</td>
<td>State Space Design for Control</td>
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<tr>
<td>SE 495</td>
<td>Senior Engineering Project II</td>
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<tr>
<td>IE 300</td>
<td>Analysis of Data</td>
<td>3</td>
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<tr>
<td>IE 310</td>
<td>Deterministic Models in Optimization</td>
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<tr>
<td>TAM 211</td>
<td>Statics</td>
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<tr>
<td>TAM 212</td>
<td>Introductory Dynamics</td>
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<td>TAM 251</td>
<td>Introductory Solid Mechanics</td>
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<td>TAM 335</td>
<td>Introductory Fluid Mechanics</td>
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<td>SE 101</td>
<td>Engineering Graphics &amp; Design</td>
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<td>SE 494</td>
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Secondary Field Option Electives

These courses enable the student to tailor the studies to one’s interests and career goals in both technical and nontechnical areas. Secondary field options are of two types: pre-approved and customized. Pre-approved secondary fields have designated titles and a specified list of courses, from which several may be selected. Approval for the substitution of a course for one on the specified list may be requested via a petition form submitted to the department. Customized secondary fields may be created to achieve goals in areas not provided by pre-approved fields. To do this, a suitable title and all the courses must be petitioned for acceptance by the department. Petition approval is based on the merit of the secondary field and the coherence of the courses within it relative to the student’s goals.

Pursuit of campus minors, dual degrees, and James Scholar contracts may be integrated with customized secondary field options. Courses taken may be applied to minors, dual degrees, or contracts as well as secondary field options.

Pre-approved Secondary Fields

Pre-approved secondary fields are listed below. The following course substitutions may be used interchangeably to comply with prerequisites of specified courses in some of the secondary fields:

- CEE 202, IE 300, STAT 400
- CEE 201, IE 310
- MSE 406, CEE 300
- ECE 486, SE 320, ME 340

Students may petition to the department for inclusion of a course in the secondary fields listed below. The most likely classes to be accepted are non-permanent and experimental offerings relevant to the various fields.

- Automotive Engineering
- Bioengineering
- Business Systems Integration and Consulting
- Civil Engineering Structures
- Communications and Computer Systems
- Computer Science
- Construction
- Control Systems
- Digital Prototyping
- Engineering Administration
- Engineering Marketing
- Environmental Quality
- Internet of Things (IOT)
- Manufacturing Engineering
- Nondestructive Testing and Evaluation
- Operations Research
- Quality Control
- Rehabilitation Engineering
- Robotics
- Theoretical and Applied Mechanics

<table>
<thead>
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<th>Code</th>
<th>Title</th>
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<tr>
<td>CEE 202</td>
<td>Data Structures</td>
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<tr>
<td>CS 440</td>
<td>Artificial Intelligence</td>
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<tr>
<td>CS 446</td>
<td>Machine Learning</td>
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<tr>
<td>ECE 431</td>
<td>Electric Machinery</td>
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<tr>
<td>ECE 464</td>
<td>Power Electronics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 486</td>
<td>Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>ME 400</td>
<td>Energy Conversion Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>ME 403</td>
<td>Internal Combustion Engines</td>
<td>3 or 4</td>
</tr>
<tr>
<td>ME 460</td>
<td>Industrial Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>ME 461</td>
<td>Computer Control of Mech Systems</td>
<td>3 or 4</td>
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<tr>
<td>SE 400</td>
<td>Engineering Law</td>
<td>3 or 4</td>
</tr>
<tr>
<td>SE 497</td>
<td>Independent Study (May be taken for up to 3 credit hours, based on automotive Engineering project approved by SFO faculty mentor)</td>
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<tr>
<td>TAM 412</td>
<td>Intermediate Dynamics</td>
<td>4</td>
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<tr>
<td>TAM 416</td>
<td>Intro to Nonlinear Dyn &amp; Vib</td>
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In addition to completing 12 credit hours from the list of approved courses above, students must complete:

Dynamics/Controls (select at least one course):
- ECE 470 | Introduction to Robotics | 4 |
- ECE 486 | Control Systems | 4 |
- ME 460 | Industrial Control Systems | 4 |
- TAM 412 | Intermediate Dynamics | 4 |
- TAM 416 | Intro to Nonlinear Dyn & Vib | 4 |

Automotive Power Systems (select at least one course):
- ME 400 | Energy Conversion Systems | 3 or 4 |
- ME 403 | Internal Combustion Engines | 3 or 4 |
- ECE 431 | Electric Machinery | 4 |
- ECE 464 | Power Electronics | 3 |

Autonomous Systems and Robotics
- CS 225 | Data Structures | 4 |
- CS 440 | Artificial Intelligence | 3 or 4 |
- CS 446 | Machine Learning | 3 or 4 |
- ECE 470 | Introduction to Robotics | 4 |
- ECE 486 | Control Systems | 4 |
- ECE 490 | Introduction to Optimization | 3 or 4 |
- ME 351 | Analysis of Mfg Processes | 3 |
- ME 461 | Computer Control of Mech Systems | 3 or 4 |
- SE 400 | Engineering Law | 3 or 4 |
- SE 411 | Reliability Engineering | 3 or 4 |
- SE 423 | Mechatronics | 3 |

Bioengineering
- BIOE 120 | Introduction to Bioengineering | 1 |
- BIOE 414 | Biomedical Instrumentation | 3 |
- BIOE 415 | Biomedical Instrumentation Lab | 2 |
- BIOE 498 | Special Topics | 3 |
- BIOP 401 | Introduction to Biophysics | 3 |
- CHEM 232 | Elementary Organic Chemistry I | 3 or 4 |
- CHEM 233 | Elementary Organic Chem Lab I | 2 |
- IE 340 | Human Factors | 4 |

Information listed in this catalog is current as of 12/2019
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<th>Course Code</th>
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<td>KIN 355</td>
<td>Biomechanics of Human Movement</td>
<td>3</td>
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<tr>
<td>MCB 150</td>
<td>Molec &amp; Cellular Basis of Life</td>
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<tr>
<td>MCB 250</td>
<td>Molecular Genetics</td>
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<tr>
<td>MCB 251</td>
<td>Exp Techniqs in Molecular Biol</td>
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<tr>
<td>MCB 401</td>
<td>Cell &amp; Membrane Physiology</td>
<td>3</td>
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<td>MCB 402</td>
<td>Sys &amp; Integrative Physiology</td>
<td>3</td>
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<tr>
<td>MCB 403</td>
<td>Cell &amp; Membrane Physiology Lab</td>
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<tr>
<td>MCB 404</td>
<td>Sys &amp; Integrative Physiol Lab</td>
<td>1 to 2</td>
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<tr>
<td>MCB 450</td>
<td>Introductory Biochemistry</td>
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<tr>
<td>SE 400</td>
<td>Engineering Law</td>
<td>3 or 4</td>
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**Business Systems Integration & Consulting**

Core Requirement:

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<th>Credits</th>
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Group I (At least one course):

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<td>Fundamentals of Accounting</td>
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<td>ACCY 201</td>
<td>Accounting and Accountancy I</td>
<td>3</td>
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<tr>
<td>ACCY 202</td>
<td>Accounting and Accountancy II</td>
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<tr>
<td>ADV 150</td>
<td>Introduction to Advertising</td>
<td>3</td>
</tr>
<tr>
<td>BADM 310</td>
<td>Mgmnt and Organizational Beh</td>
<td>3</td>
</tr>
<tr>
<td>BADM 311</td>
<td>Leading Individuals and Teams</td>
<td>3</td>
</tr>
<tr>
<td>BADM 312</td>
<td>Designing and Managing Orgs</td>
<td>3</td>
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<tr>
<td>BADM 320</td>
<td>Principles of Marketing</td>
<td>3</td>
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<tr>
<td>BADM 445</td>
<td>Small Business Consulting</td>
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<tr>
<td>BADM 446</td>
<td>Entrepreneurship: New Venture Creation</td>
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<tr>
<td>BTW 250</td>
<td>Principles Bus Comm</td>
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<td>BTW 261</td>
<td>Principles Tech Comm</td>
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<td>FIN 221</td>
<td>Corporate Finance</td>
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<td>FIN 300</td>
<td>Financial Markets</td>
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Group II (At least one course)

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<td>Info Sys Analysis and Design</td>
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<tr>
<td>CS 225</td>
<td>Data Structures</td>
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All other 200-, 300-, 400-level CS courses

**Civil Engineering Structures**

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<th>Course Title</th>
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<td>Geotechnical Engineering</td>
<td>3</td>
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<td>CEE 460</td>
<td>Steel Structures I</td>
<td>3</td>
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<tr>
<td>CEE 461</td>
<td>Reinforced Concrete I</td>
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<td>CEE 462</td>
<td>Steel Structures II</td>
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<td>CEE 463</td>
<td>Reinforced Concrete II</td>
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<tr>
<td>CEE 465</td>
<td>Design of Structural Systems</td>
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<td>Engineering Law</td>
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**Computer Science**

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<td>Discrete Structures</td>
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<td>CS 225</td>
<td>Data Structures</td>
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<tr>
<td>CS 410</td>
<td>Text Information Systems</td>
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<td>CS 411</td>
<td>Database Systems</td>
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<td>CS 425</td>
<td>Distributed Systems</td>
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<td>CS 438</td>
<td>Communication Networks</td>
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**Construction**

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<td>CEE 310</td>
<td>Transportation Engineering</td>
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<td>CEE 320</td>
<td>Construction Engineering</td>
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<td>CEE 380</td>
<td>Geotechnical Engineering</td>
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<tr>
<td>CEE 420</td>
<td>Construction Productivity</td>
<td>3 or 4</td>
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<tr>
<td>CEE 421</td>
<td>Construction Planning</td>
<td>3 or 4</td>
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<td>CEE 422</td>
<td>Construction Cost Analysis</td>
<td>3 or 4</td>
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<td>CEE 460</td>
<td>Steel Structures I</td>
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<td>CEE 461</td>
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<td>CEE 465</td>
<td>Design of Structural Systems</td>
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<tr>
<td>ME 330</td>
<td>Engineering Materials (Credit will not be given for CEE 300, ME 330 and MSE 280 (only one course may be taken out of these three))</td>
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**Control Systems**

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<tr>
<td>ECE 470</td>
<td>Introduction to Robotics</td>
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<td>ECE 486</td>
<td>Control Systems</td>
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<td>ECE 490</td>
<td>Introduction to Optimization</td>
<td>3 or 4</td>
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<td>IE 410</td>
<td>Advanced Topics in Stochastic Processes &amp; Applications</td>
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<td>MATH 444</td>
<td>Elementary Real Analysis</td>
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<td>MATH 461</td>
<td>Probability Theory</td>
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<td>MATH 464</td>
<td>Statistics and Probability II</td>
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<td>ME 360</td>
<td>Signal Processing</td>
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<td>ME 460</td>
<td>Industrial Control Systems</td>
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<td>ME 461</td>
<td>Computer Cntrl of Mech Systems</td>
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<td>SE 400</td>
<td>Engineering Law</td>
<td>3 or 4</td>
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<tr>
<td>SE 420</td>
<td>Digital Control Systems</td>
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<tr>
<td>SE 422</td>
<td>Robot Dynamics and Control</td>
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<tr>
<td>SE 423</td>
<td>Mechatronics</td>
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</tr>
<tr>
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**Digital Prototyping**

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<tbody>
<tr>
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<td>Design for Manufacturability</td>
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<tr>
<td>ME 351</td>
<td>Analysis of Mfg Processes</td>
<td>3</td>
</tr>
<tr>
<td>ME 451</td>
<td>Computer-Aided Mfg Systems</td>
<td>3 or 4</td>
</tr>
<tr>
<td>ME 452</td>
<td>Num Control of Mfg Processes</td>
<td>3 or 4</td>
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<tr>
<td>ME 471</td>
<td>Finite Element Analysis</td>
<td>3 or 4</td>
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<tr>
<td>SE 402</td>
<td>Comp-Aided Product Realization</td>
<td>3 or 4</td>
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<tr>
<td>TAM 302</td>
<td>Engineering Design Principles</td>
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**Engineering Administration**

Core Requirement:

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<tbody>
<tr>
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<td>3 or 4</td>
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Elective Options:

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<th>Course Title</th>
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<td>ACCY 200</td>
<td>Fundamentals of Accounting</td>
<td>3</td>
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<tr>
<td>ACCY 201</td>
<td>Accounting and Accountancy I</td>
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<td>ADV 150</td>
<td>Introduction to Advertising</td>
<td>3</td>
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Systems Engineering & Design, BS

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BADM 310</td>
<td>Mgmt and Organizational Beh</td>
<td>3</td>
</tr>
<tr>
<td>BADM 311</td>
<td>Leading Individuals and Teams</td>
<td>3</td>
</tr>
<tr>
<td>BADM 312</td>
<td>Designing and Managing Orgs</td>
<td>3</td>
</tr>
<tr>
<td>BADM 313</td>
<td>Strategic Human Resource Management</td>
<td>3</td>
</tr>
<tr>
<td>BADM 375</td>
<td>Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BADM 380</td>
<td>International Business</td>
<td>3</td>
</tr>
<tr>
<td>BADM 381</td>
<td>Multinational Management</td>
<td>3</td>
</tr>
<tr>
<td>BTW 250</td>
<td>Principles Bus Comm</td>
<td>3</td>
</tr>
<tr>
<td>BTW 261</td>
<td>Principles Tech Comm</td>
<td>3</td>
</tr>
<tr>
<td>ECON 302</td>
<td>Inter Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>FIN 221</td>
<td>Corporate Finance</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 205</td>
<td>Business Location Decisions</td>
<td>3</td>
</tr>
<tr>
<td>IE 330</td>
<td>Industrial Quality Control</td>
<td>3</td>
</tr>
<tr>
<td>IE 340</td>
<td>Human Factors</td>
<td>4</td>
</tr>
<tr>
<td>IE 361</td>
<td>Production Planning &amp; Control</td>
<td>3</td>
</tr>
<tr>
<td>IE 420</td>
<td>Financial Engineering</td>
<td>3 or 4</td>
</tr>
<tr>
<td>IE 445</td>
<td>Human Performance and Cognition in Context</td>
<td>3 or 4</td>
</tr>
<tr>
<td>PS 321</td>
<td>Principles of Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>SE 411</td>
<td>Reliability Engineering</td>
<td>3 or 4</td>
</tr>
</tbody>
</table>

### Engineering Marketing

**Core Requirement:**

SE 400 Engineering Law 3 or 4

**Elective Options:**

- ACCY 200 Fundamentals of Accounting 3
- ACCY 201 Accounting and Accountancy I 3
- ACCY 202 Accounting and Accountancy II 3
- ADV 150 Introduction to Advertising 3
- BADM 310 Mgmt and Organizational Beh 3
- BADM 320 Principles of Marketing 3
- BADM 322 Marketing Research 3
- BADM 323 Marketing Communications 3
- BADM 325 Consumer Behavior 3
- BADM 327 Marketing to Business and Govt 3
- BADM 380 International Business 3
- BADM 382 International Marketing 3
- BADM 420 Advanced Marketing Management 3
- BTW 250 Principles Bus Comm 3
- BTW 261 Principles Tech Comm 3
- PSYC 245 Industrial Org Psych 3

### Environmental Quality

- ACE 310 Natural Resource Economics 3
- CEE 330 Environmental Engineering 3
- CEE 437 Water Quality Engineering 3
- CEE 440 Fate Cleanup Environ Pollutant 4
- CEE 442 Environmental Engineering Principles, Physical 4
- CEE 443 Env Eng Principles, Chemical 4
- CEE 444 Env Eng Principles, Biological 4
- CEE 445 Air Quality Modeling 4
- CEE 446 Air Quality Engineering 4
- ENVS 336 Tomorrow’s Environment 3
- ENVS 431 Environ Toxicology & Health 3
- IB 105 Environmental Biology 3
- NPRE 241 Intro to Radiation Protection 2
- NRES 419 Env and Plant Ecosystems 3
- NRES 472 Environmental Psychology 4
- SE 400 Engineering Law 3 or 4

### Internet of Things

**Core Requirements:**

ECE 385 Digital Systems Laboratory 3
- SE 423 Mechatronics 3

**Elective Options:**

- CS 225 Data Structures 4
- CS 233 Computer Architecture 4
- CS 241 System Programming 4
- CS 125 Intro to Computer Science 4
- CS 173 Discrete Structures 3
- ECE 120 Introduction to Computing 4

### Manufacturing Engineering

ME 330 Engineering Materials (Credit will not be given for CEE 300, ME 330 and MSE 280 (only one course may be taken out of these three)) 4

SE 400 Engineering Law 3 or 4
- SE 423 Mechatronics 3
- Other courses from Digital Protoyping and Control Systems SFO

### Nondestructive Testing and Evaluation

**Core Requirement:**

SE 412 Nondestructive Evaluation 3 or 4

**Elective Options:**

- CEE 300 Behavior of Materials (Credit is not give for CEE 300 and MSE 280) 4
- CS 225 Data Structures 4
- CS 440 Artificial Intelligence 3 or 4
- CS 446 Machine Learning 3 or 4
- ECE 470 Introduction to Robotics 4
- ECE 473 Fund of Engrg Acoustics 3 or 4
- ME 351 Analysis of Mfg Processes 3
- ME 471 Finite Element Analysis 3 or 4
- SE 400 Engineering Law 3 or 4
- SE 411 Reliability Engineering 3 or 4
- TAM 412 Intermediate Dynamics 4
- TAM 456 Experimental Stress Analysis 3

### Operations Research

- IE 360 Facilities Planning and Design 3
- IE 361 Production Planning & Control 3
- MATH 461 Probability Theory 3 or 4
- MATH 464 Statistics and Probability II 3 or 4
- ME 351 Analysis of Mfg Processes 3
- ME 451 Computer-Aided Mfg Systems 3 or 4
- SE 400 Engineering Law 3 or 4
- SE 411 Reliability Engineering 3 or 4

### Rehabilitation Engineering
CHEM 232  Elementary Organic Chemistry I  3 or 4
ECE 414  Biomedical Instrumentation  3
ECE 415  Biomedical Instrumentation Lab  2
MCB 150  Molec & Cellular Basis of Life  4
MCB 250  Molecular Genetics  3
MCB 251  Exp Techniqs in Molecular Biol  2
REHB 401  Introduction to Rehabilitation  4
REHB 402  Medical Aspects of Disability  4
SE 400  Engineering Law  3 or 4

Theoretical and Applied Mechanics

CEE 300  Behavior of Materials (Credit will not be given for CEE 300, ME 330 and MSE 280 (only one course may be taken out of these three))  4
ME 471  Finite Element Analysis  3 or 4
SE 400  Engineering Law  3 or 4
TAM 412  Intermediate Dynamics  4
TAM 424  Mechanics of Structural Metals  3 or 4
TAM 428  Mechanics of Composites  3
TAM 435  Intermediate Fluid Mechanics  4
TAM 445  Continuum Mechanics  4
TAM 451  Intermediate Solid Mechanics  4
TAM 456  Experimental Stress Analysis  3

Customized Secondary Fields

Customized secondary fields differ from pre-approved ones in that no sets of specified courses to choose from have been predefined. For all customized secondary field options, a course list must be constructed and submitted for approval by the department.

The following list contains examples of over fifty titles of customized secondary field options which have been approved. The complete list may be found at the department's secondary field website (http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option). Additional titles beyond those listed may be proposed.

- A foreign language (several)
- An engineering discipline (several)
- Audio Engineering
- Economics
- Entrepreneurship
- Finance
- Fluid Dynamics
- International Business
- Mathematics
- Pre-Law
- Pre-Med
- Renewable Energy

Technical Electives

The design elective augments a student’s knowledge in one or more sub-disciplines of mechanics and structures, control systems, and decision-making that support a systems approach to engineering. The engineering science elective extends the knowledge of that area.

Code   Title  Hours
Design elective selected from the departmentally approved list of Design Electives below:
SE 410  Component Design  3
SE 420  Digital Control Systems  4
SE 423  Mechatronics  3
SE 413  Engineering Design Optimization  3 or 4

Engineering science elective selected from the departmentally approved list of Engineering Science Electives below:
MSE 280  Engineering Materials  3
ME 200  Thermodynamics  3

General Education Requirements

Code   Title  Hours
A minimum of six courses is required, as follows:
ECON 102  Microeconomic Principles  3
or ECON 103  Macroeconomic Principles
Social and Behavioral Sciences  3
Humanities & the Arts  6
The Grainger College of Engineering Liberal Education course list, or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts
Cultural Studies: Non-Western Cultures (1 course)
Cultural Studies: U.S. Minorities Cultures (1 course)
Cultural Studies: Western/Comparative Cultures (1 course)

Non-Primary Language Requirement

Code   Title  Hours
Completion of the third semester or equivalent of a non-primary language is required. Completion of three years of a single language in high school satisfies this requirement.

University Composition

These courses teach fundamentals of expository writing.

Code   Title  Hours
Choose one:
RHET 105  Writing and Research
CMN 111 & CMN 112 Oral & Written Comm I and Oral & Written Comm II
ESL 111 & ESL 112 Intro to Academic Writing I and Intro to Academic Writing II
ESL 115  Principles of Academic Writing
Advanced Composition (satisfied by completing the combination SE 494 + SE 495 in the Systems Engineering and Design Technical Core)
Free Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Free Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree.

Total Hours of Curriculum to Graduate 128

1 External transfer students take ENG 300 instead.

2 MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

3 Students fulfilling the corresponding Campus Minor may simultaneously complete the requirements of this Systems Engineering and Design secondary field option.

for the degree of Bachelor of Science in Systems Engineering and Design (formerly General Engineering)

Secondary Field Options

Secondary field options are of two types: pre-approved and customized. Pre-approved secondary fields have designated titles and a specified list of courses, from which several may be selected. Approval for the substitution of a course for one on the specified list may be requested via a petition form submitted to the department. Customized secondary fields may be created to achieve goals in areas not provided by pre-approved fields. To do this, a suitable title and all the courses must be petitioned for acceptance by the department. Petition approval is based on the merit of the secondary field and the coherence of the courses within it relative to the student’s goals.

Pursuit of campus minors, dual degrees, and James Scholar contracts may be integrated with customized secondary field options. Courses taken may be applied to minors, dual degrees, or contracts as well as secondary field options.

Pre-approved Secondary Fields

Pre-approved secondary fields are listed below. Approved courses for each are specified at the department’s secondary field website (http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option). The following course substitutions may be used interchangeably to comply with prerequisites of specified courses in some of the secondary fields:

- CEE 202, IE 300, STAT 400
- CEE 201, IE 310
- MSE 406, CEE 300
- ECE 486, SE 320, ME 340

Students may petition to the department for inclusion of a course in the secondary fields listed below. The most likely classes to be accepted are non-permanent and experimental offerings relevant to the various fields. A current list of these may be found at the department’s secondary field website (http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option).

- Automotive Engineering
- Bioengineering
- Business Systems Integration and Consulting

Customized Secondary Fields

Customized secondary fields differ from pre-approved ones in that no sets of specified courses to choose from have been predefined. For all customized secondary field options, a course list must be constructed and submitted for approval by the department.

The following list contains examples of over fifty titles of customized secondary field options which have been approved. The complete list may be found at the department’s secondary field website (http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option). Additional titles beyond those listed may be proposed.

- A foreign language (several)
- An engineering discipline (several)
- Audio Engineering
- Economics
- Entrepreneurship
- Finance
- Fluid Dynamics
- International Business
- Mathematics
- Pre-Law
- Pre-Med
- Renewable Energy

Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each
individual’s case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

### First Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 102 General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 103 General Chemistry Lab I</td>
<td>1</td>
</tr>
<tr>
<td>Liberal education elective(^3)</td>
<td>3</td>
</tr>
<tr>
<td>ENG 100 Engineering Orientation</td>
<td>0</td>
</tr>
<tr>
<td>SE 101 Engineering Graphics Design or RHET 105(^1)</td>
<td>3-4</td>
</tr>
<tr>
<td>MATH 221(^6) Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>SE 100 Introduction to ISE</td>
<td>1</td>
</tr>
<tr>
<td><strong>Semester Hours</strong></td>
<td>15-16</td>
</tr>
</tbody>
</table>

#### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 110 Introduction to Electronics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 211 University Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>MATH 231 Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>CS 101 Intro Computing: Engrg Sci</td>
<td>3</td>
</tr>
<tr>
<td>RHET 105 Writing and Research or SE 101(^7)</td>
<td>4-3</td>
</tr>
<tr>
<td><strong>Semester Hours</strong></td>
<td>17-16</td>
</tr>
</tbody>
</table>

### Second Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 241 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212 University Physics: Elec Mag</td>
<td>4</td>
</tr>
<tr>
<td>TAM 211 Statics</td>
<td>3</td>
</tr>
<tr>
<td>Liberal education elective(^3)</td>
<td>3</td>
</tr>
<tr>
<td>SE 261 Business Side of Engineering</td>
<td>1</td>
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<tr>
<td><strong>Semester Hours</strong></td>
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#### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 300 Analysis of Data</td>
<td>3</td>
</tr>
<tr>
<td>MATH 285 Intro Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 213 Univ Physics: Thermal Physics</td>
<td>2</td>
</tr>
<tr>
<td>TAM 212 Introductory Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>TAM 251 Introductory Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>SE 290 ISE Undergraduate Seminar</td>
<td>0</td>
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<tr>
<td>Liberal education elective(^3)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Semester Hours</strong></td>
<td>17</td>
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### Third Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ECE 211 Analog Circuits Systems</td>
<td>2</td>
</tr>
<tr>
<td>MATH 415 Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Secondary field option elective(^4)</td>
<td>3</td>
</tr>
<tr>
<td>SE 310 Design of Structures and Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>SE 320 Control Systems</td>
<td>4</td>
</tr>
<tr>
<td><strong>Semester Hours</strong></td>
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</tr>
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</table>

#### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>IE 310 Deterministic Models in Optimization</td>
<td>3</td>
</tr>
<tr>
<td>TAM 335 Introductory Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Liberal education elective(^3)</td>
<td>3</td>
</tr>
</tbody>
</table>

### Fourth Year

#### First Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE 311 Engineering Design Analysis</td>
<td>3</td>
</tr>
<tr>
<td>SE 312 Instrumentation and Test Lab</td>
<td>1</td>
</tr>
<tr>
<td>SE 424 State Space Design for Control</td>
<td>3</td>
</tr>
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</table>

**Semester Hours**: 17

#### Second Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE 494 &amp; SE 495(^5) &amp; SE 496</td>
<td>5-3</td>
</tr>
<tr>
<td>Design elective(^7)</td>
<td>3</td>
</tr>
<tr>
<td>Engineering science elective(^8)</td>
<td>3</td>
</tr>
<tr>
<td>Secondary field option elective(^4)</td>
<td>3</td>
</tr>
<tr>
<td>Liberal education elective(^3,5)</td>
<td>3</td>
</tr>
<tr>
<td>Free electives</td>
<td>6</td>
</tr>
</tbody>
</table>

**Semester Hours**: 17-15

Total Hours: 128

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1. RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is SE 101.
2. MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.
3. Liberal education electives ([https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-LiberalEducationElectives](https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-LiberalEducationElectives)) must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. ECON 102 or ECON 103 must be one of the social & behavioral sciences courses, highly recommended before the fourth semester. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s), (ii) one non-western, and (iii) one U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy the Humanities and the Arts and cultural studies course requirements. Courses from the western, non-western, and U.S. minority lists that fall into free electives or other categories may also be used satisfy the Humanities and the Arts or cultural studies requirements.
4. Selected from the departmentally approved lists of Secondary Field Option Electives ([http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option/preapproved-secondary-field](http://ise.illinois.edu/undergraduate-programs/general-engineering-degree/secondary-field-option/preapproved-secondary-field)) or by petition to the department.
5. SE 494 and SE 495 may be taken in the first or second semester of the fourth year as authorized. The alternative is a liberal education elective.
6. Combination satisfies the General Education Advanced Composition requirement.

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Information listed in this catalog is current as of 12/2019.
Selected from the departmentally approved list of Design Electives (https://ise.illinois.edu/undergraduate/electives.html).

Selected from the departmentally approved list of Engineering Science Electives (https://ise.illinois.edu/undergraduate/electives.html).