

# Industrial Engineering (BS)

## Overview

## Plan Requirements

### First Year

Fall Semester		Hours
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory <sup>1</sup>	4
E 101	Introduction to Engineering & Problem Solving	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research <sup>2</sup>	4
MA 141	Calculus I <sup>1</sup>	4
<b>Hours</b>		<b>14</b>

### Spring Semester

PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory <sup>1</sup>	4
MA 241	Calculus II <sup>1</sup>	4
Select one of the following:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
E 102	Engineering in the 21st Century	2
<b>Hours</b>		<b>13</b>

### Second Year

Fall Semester		Hours
ISE 135	Computer-Based Modeling for Industrial Engineering <sup>3</sup>	3
MA 242	Calculus III	4
MSE 200 or MSE 201	Mechanical Properties of Structural Materials or Structure and Properties of Engineering Materials	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
ST 371	Introduction to Probability and Distribution Theory <sup>2</sup>	3
<b>Hours</b>		<b>17</b>

### Spring Semester

ECE 331	Principles of Electrical Engineering	3
ISE 215	Foundations of Design & 3D Modeling for Engineers	1
ISE 216	Product Development and Rapid Prototyping	3
MA 303	Linear Analysis <sup>1, 4</sup>	3

ST 372	Introduction to Statistical Inference and Regression	3
<b>Hours</b>		<b>13</b>

### Third Year

Fall Semester		Hours
ISE 311	Engineering Economic Analysis	3
ISE 315	Introduction to Computer-Aided Manufacturing	1
ISE 316	Manufacturing Engineering I - Processes	3
CE 214	Engineering Mechanics-Statics	3
ISE 361	Deterministic Models in Industrial Engineering	3
Ethics Electives (p. 2)		
<b>Hours</b>		<b>13</b>

### Spring Semester

Engineering Sciences Elective (p. 2)		3
ISE 352 or ISE 443	Fundamentals of Human-Machine Systems Design or Quality Design and Control	3
ISE 362	Stochastic Models in Industrial Engineering	3
ISE 443	Quality Design and Control	3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>15</b>

### Fourth Year

Fall Semester		Hours
ISE 408 or ISE 441 or ISE 453	Design and Control of Production and Service Systems or Introduction to Simulation or Modeling and Analysis of Supply Chains	3
ISE 398	Lean Six Sigma for Industrial Engineering	1
ISE 441 or ISE 408 or ISE 453	Introduction to Simulation or Design and Control of Production and Service Systems or Modeling and Analysis of Supply Chains	3
Select one of the following:		3
ISE 520	Healthcare Systems Performance Improvement I	
Technical Elective (p. 2)		
ISE 453	Modeling and Analysis of Supply Chains	
ENG 331	Communication for Engineering and Technology	3
<b>Hours</b>		<b>13</b>
Spring Semester		Hours
ISE 498 or ISE 521	Senior Design Project or Healthcare Systems Performance Improvement II	3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>6</b>
<b>Total Hours</b>		<b>104</b>

<sup>1</sup> A grade of C or higher is required.

<sup>2</sup> A grade of C- or higher is required.

Code	Title	Hours	Counts towards
<b>GEP Courses</b>			
	GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )	6	
	GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )	3	
	GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )	2	
	GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )	3	
	GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )	3	
	GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)		
	World Language Proficiency ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/</a> ) (verify requirement)		
<b>Total Hours</b>		<b>17</b>	

## Engineering Sciences Electives

Code	Title	Hours	Counts towards
CE 225	Mechanics of Solids	3	
CE 282	Hydraulics	3	
MAE 201	Thermal-Fluid Sciences	3	
MAE 208	Engineering Dynamics	3	
MAE 214	Solid Mechanics	3	
MAE 308	Fluid Mechanics	3	
MSE 355	Electrical, Magnetic and Optical Properties of Materials	3	

## Ethics Electives

Code	Title	Hours	Counts towards
IDS 201	Environmental Ethics	3	

IDS 303	Humans and the Environment	3	
NR 303	Humans and the Environment	3	
PHI 214	Issues in Business Ethics	3	
PHI/STS 325	Bio-Medical Ethics	3	
STS 214	Introduction to Science, Technology, and Society	3	
STS 302	Contemporary Science, Technology and Human Values	3	
STS 304	Ethical Dimensions of Progress	3	
STS 322	Technological Catastrophes	3	

## Technical Electives

Code	Title	Hours	Counts towards
BEC 475/575	Global Regulatory Affairs for Medical Products	3	
E 304	Introduction to Nano Science and Technology	3	
ECE/MAE 482	Engineering Entrepreneurship and New Product Development I	3	
IE 240	Human-Centered Design	3	
ISE 411/511	Decision Making and Game Theory for Supply Chains	3	
ISE 413/513	Humanitarian Logistics	3	
ISE 416	Manufacturing Engineering II - Automation	3	
ISE 417	Database Applications in Industrial & Systems Engineering	3	
ISE 425/525/OR 525	Medical Decision Making	3	
ISE 433/533/OR 533	Service Systems Engineering	3	

ISE 435/535	Python Programming for Industrial & Systems Engineers	3
ISE 437	Data Analytics for Industrial Engineering	3
ISE 447/547	Applications of Data Science in Healthcare	3
ISE 452	Advanced Human-Machine Systems Design	3
ISE 489	Special Topics in Industrial and Systems Engineering	3
ISE 495	Project Work in Industrial Engineering	1-3
ISE 519	Database Applications in Industrial and Systems Engineering	3
ISE 520	Healthcare Systems Performance Improvement I	3
ISE 553	Modeling and Analysis of Supply Chains	3
ISE 540	Human Factors In Systems Design	3
ISE 541	Occupational Safety Engrg	3
ISE 544	Occupational Biomechanics	3
ISE 552	Design and Control of Production and Service Systems	3
MSE 445/545	Ceramic Processing	3
MSE 565	Introduction to Nanomaterials	3
PSE 476	Environmental Life Cycle Analysis	3
PSY 340	Human Factors Psychology	3
PSY 400	Perception	3
PSY 420	Cognitive Processes	3

ST 430	Introduction to Regression Analysis	3
ST 431	Introduction to Experimental Design	3
ST 432	Introduction to Survey Sampling	3
TE 301	Engineering Textile Structures I: Linear Assemblies	3
TE 302	Textile Manufacturing Processes and Systems II	4
TE/TMS 565	Textile Composites	3

### Industrial Engineering (BS) (14IEBS)

## Semester Sequence

This is a sample.

### First Year

Fall Semester		Hours
CH 101 & CH 102 or PY 205 <i>and</i> PY 206	Chemistry - A Molecular Science or Physics for Engineers and Scientists I <i>and</i> Physics for Engineers and Scientists I Laboratory	4
E 101	Introduction to Engineering & Problem Solving	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research	4
MA 141	Calculus I	4
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
<b>Hours</b>		<b>15</b>

### Spring Semester

EC 205 or EC 201 or ARE 201 or ARE 201A	Fundamentals of Economics or Principles of Microeconomics or Introduction to Agricultural & Resource Economics or Introduction to Agricultural & Resource Economics	3
MA 241	Calculus II	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory	4
E 102	Engineering in the 21st Century	2
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
<b>Hours</b>		<b>17</b>

**Second Year**

**Fall Semester**

ISE 135	Computer-Based Modeling for Industrial Engineering	3
MA 242	Calculus III	4
MSE 200 or MSE 201	Mechanical Properties of Structural Materials or Structure and Properties of Engineering Materials	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
ST 371	Introduction to Probability and Distribution Theory <sup>2</sup>	3
<b>Hours</b>		<b>17</b>

**Spring Semester**

ECE 331	Principles of Electrical Engineering	3
ISE 215	Foundations of Design & 3D Modeling for Engineers	1
ISE 216	Product Development and Rapid Prototyping	3
MA 303	Linear Analysis	3
ST 372	Introduction to Statistical Inference and Regression	3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
<b>Hours</b>		<b>16</b>

**Third Year**

**Fall Semester**

ISE 311	Engineering Economic Analysis	3
ISE 316	Manufacturing Engineering I - Processes	3
ISE 315	Introduction to Computer-Aided Manufacturing	1
CE 214 or MAE 206	Engineering Mechanics-Statics or Engineering Statics	3
Ethics (p. 2)		Verify
ISE 361	Deterministic Models in Industrial Engineering	3
<b>Hours</b>		<b>13</b>

**Spring Semester**

Engineering Science Elective (p. )		3
ISE 352 or ISE 443	Fundamentals of Human-Machine Systems Design or Quality Design and Control	3
ISE 362	Stochastic Models in Industrial Engineering	3
ISE 443	Quality Design and Control	3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>15</b>

**Fourth Year**

**Fall Semester**

GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
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ISE 408 or ISE 441 or ISE 453	Design and Control of Production and Service Systems or Introduction to Simulation or Modeling and Analysis of Supply Chains	3
ISE 441 or ISE 408 or ISE 453	Introduction to Simulation or Design and Control of Production and Service Systems or Modeling and Analysis of Supply Chains	3
ISE 398	Lean Six Sigma for Industrial Engineering	1
Select one of the following:		3
ISE 520	Healthcare Systems Performance Improvement I	
Technical Elective (p. )		
ISE 453	Modeling and Analysis of Supply Chains	3
ENG 331	Communication for Engineering and Technology	3
<b>Hours</b>		<b>19</b>
<b>Spring Semester</b>		
ISE 498 or ISE 521	Senior Design Project (CP) or Healthcare Systems Performance Improvement II	3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
Technical Elective (p. 2)		3
Technical Elective (p. 2)		3
		3
<b>Hours</b>		<b>15</b>
<b>Total Hours</b>		<b>127</b>

**Career Opportunities**

Industrial and Systems engineers can be found everywhere! According to the Bureau of Labor Statistics, ISEs will be highly sought after in the coming decade. This is not surprising given the cost and efficiency pressure on both manufacturing and service sectors. Industrial engineers are hired by virtually all segments of industry.

Industrial Engineers may work in hospitals and healthcare consulting firms to make healthcare delivery more cost effective as well as in high tech manufacturing industries. Another area in which ISEs play a pivotal role, is in successful integration of global business partners. As companies continue to seek a global presence, industrial engineers will be involved in the design of new supply chain networks or qualification of manufacturing processes/facilities.

Given the level of impact made by ISEs in industry today it is not surprising that our current job placement rate is among the highest in the College of Engineering, above 90% within 3 months of graduation. Many ISEs rise to the management ranks throughout the career and there have been several ISEs who have become CEOs: Tim Cook (Apple Inc.), Mike Duke (Walmart) & Charles Holliday (Dupont) to name a few.

**Career Titles**

- Airport Engineer
- Cost Estimator
- Energy Engineer

- Engineering Professor
- Factory Layout Engineer
- Industrial Designer
- Industrial Engineer
- Industrial Engineering Technologists and Technicians
- Manufacturing Engineers
- Nanotechnology Engineering Technologists and Technicians
- Product Safety Engineer
- Quality Control Managers
- Solar Energy Systems Engineers
- Transportation Engineer

## Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

Institute of Industrial & Systems Engineers (<http://www.iienet2.org/Default.aspx>)

Human Factors and Ergonomic Society (<https://www.hfes.org/home/>)

Society for Health Systems (<https://www.iise.org/shs/>)

Association for Supply Chain Management (<https://www.ascm.org/>)

Institute for Operations Research & the Management Sciences (<https://www.informs.org/>)

National Society of Professional Engineers (<https://www.nspe.org/>)