

# Mechanical Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

## Plan Requirements

### First Year

Fall Semester		Hours
CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
E 101	Introduction to Engineering & Problem Solving <sup>2</sup>	1
E 115	Introduction to Computing Environments	1
MA 141	Calculus I <sup>1</sup>	4
Acad Writing Research (p. 2) <sup>2</sup>		4
Select one of the following Economic courses:		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	
<b>Hours</b>		<b>17</b>

### Spring Semester

CSC 113	Introduction to Computing - MATLAB	3
MA 241	Calculus II <sup>1</sup>	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory <sup>1</sup>	4
GC 120	Foundations of Graphics	3
E 102	Engineering in the 21st Century	2
<b>Hours</b>		<b>16</b>

### Second Year

Fall Semester		Hours
MA 242	Calculus III	4
MAE 206	Engineering Statics <sup>2</sup>	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
MAE 200	Introduction to Mechanical Engineering Design	1
ST 370	Probability and Statistics for Engineers	3
<b>Hours</b>		<b>15</b>

### Spring Semester

MA 341	Applied Differential Equations I	3
MAE 208	Engineering Dynamics <sup>2</sup>	3
MAE 201	Engineering Thermodynamics I <sup>2</sup>	3
MAE 214	Solid Mechanics <sup>2</sup>	3
MAE 305	Mechanical Engineering Laboratory I	1
<b>Hours</b>		<b>13</b>

### Third Year

Fall Semester		Hours
ENG 331	Communication for Engineering and Technology	3
MAE 302	Engineering Thermodynamics II	3
MAE 306	Mechanical Engineering Laboratory II	1
MAE 308	Fluid Mechanics	3
MAE 315	Dynamics of Machines	3
<b>Hours</b>		<b>13</b>

### Spring Semester

ECE 331	Principles of Electrical Engineering	3
MAE 310	Heat Transfer Fundamentals	3
MAE 316	Strength of Mechanical Components	3
MSE 200	Mechanical Properties of Structural Materials	3
Tech Elective (p. 2)		3
<b>Hours</b>		<b>15</b>

### Fourth Year

Fall Semester		Hours
MAE 435	Principles of Automatic Control	3
MAE 405	Controls Lab	1
ISE 311	Engineering Economic Analysis	3
Select one of following ME Senior Design Part 1:		3
MAE 415	Mechanical Engineering Design I (This course should be followed by MAE 416)	
MAE 482	Engineering Entrepreneurship and New Product Development I (This course should be followed by MAE 483)	
Tech Elective (p. 2)		3
<b>Hours</b>		<b>13</b>

### Spring Semester

Select one of following ME Senior Design Part 2 based on Senior Design Part 1 choice:		4
MAE 416	Mechanical Engineering Design II	
MAE 483 & MAE 484	Engineering Entrepreneurship and New Product Development II and Engineering Entrepreneurship Senior Design Lab	
Tech Elective (p. 2)		3
Ethics Elective (p. 2)		
<b>Hours</b>		<b>7</b>
<b>Total Hours</b>		<b>109</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 US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</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)	
Foreign Language Proficiency ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/</a> ) (verify requirement)	
<b>Total Hours</b>	<b>17</b>

### Ethics Elective

Code	Title	Hours	Counts towards
IDS 201	Environmental Ethics	3	
MS 402	Advanced Military Science - Military Justice, Ethics and Professionalism	3	
NS 420	Naval Leadership and Ethics	3	
PHI 214	Issues in Business Ethics	3	
PHI 227	Data Ethics	3	
PHI/STS 325	Bio-Medical Ethics	3	
PHI 375	Ethics	3	
STS 302	Contemporary Science, Technology and Human Values	3	
STS 304	Ethical Dimensions of Progress	3	

### Acad Writing Research

Code	Title	Hours	Counts towards
<b>Acad Writing Research</b>			
ENG 101	Academic Writing and Research	4	
FLE 101	Academic Writing and Research	4	
<b>Transfer Sequence</b>			
ENG 1GEP		3	
ENG 202	Disciplinary Perspectives in Writing	3	

### Tech Electives

Code	Title	Hours	Counts towards
<b>Choose From:</b>			
<b>ME technical electives</b>			
MAE 342	Introduction to Automotive Engineering	3	
MAE 403	Air Conditioning	3	
MAE 406	Energy Conservation in Industry	3	
MAE 407	Steam and Gas Turbines	3	
MAE 408	Internal Combustion Engine Fundamentals	3	
MAE 410	Modern Manufacturing Processes	3	
MAE 412	Design of Thermal System	3	
MAE 413	Design of Mechanical Systems	3	
MAE 420	Dynamic Analysis of Human Movement	3	
MAE 421	Design of Solar Energy Systems	3	
MAE 426	Fundamentals of Product Design	3	
MAE 430	Applied Finite Element Analysis	3	
MAE 440	Non-Destructive Testing and Evaluation	3	
MAE 495	Special Topics in Mechanical and Aerospace Engineering	1-3	

MAE 496	Undergraduate Project Work in Mechanical and Aerospace Engineering	1-6	MAE 518	Acoustic Radiation I	3
<b>AE technical electives</b>			MAE 520	Dynamic Analysis of Human Movement	3
MAE 452	Aerodynamics of V/STOL Vehicles	3	MAE 521	Linear Control and Design For MIMO Systems	3
MAE 455	Boundary Layer Theory	3	MAE 522	Non Linear System Analysis and Control	3
MAE 456	Computational Methods in Aerodynamics	3	MAE 525	Advanced Flight Vehicle Stability and Control	3
MAE 457	Flight Vehicle Stability and Control	3	MAE 526	Fundamentals of Product Design	3
MAE 459	Rocket Propulsion	3	MAE 528	Experimental Flight Testing	3
MAE 458	Propulsion	3	MAE 531	Engineering Design Optimization	3
MAE 467	Introduction to Space Flight	3	MAE 532	Smart Structures and Micro-Transducers	3
MAE 470	Space Exploration Systems	3	MAE 533	Finite Element Analysis I	3
MAE 472	Aerospace Structures II	3	MAE 534	Mechatronics Design	3
<b>MAE 500-level courses (with departmental approval)</b>			MAE 535	Design of Electromechanical Systems	3
Available to students who are admitted to an engineering ABM program OR have a minimum 3.5 overall GPA and completed all required 3rd year MAE lecture courses			MAE 536	Micro/Nano Electromechanical Systems	3
MAE 501	Advanced Engineering Thermodynamics	3	MAE 537	Mechanics Of Composite Structures	3
MAE 504	Fluid Dynamics Of Combustion I	3	MAE 538	Smart Structures and Materials	3
MAE 505	Heat Transfer Theory and Applications	3	MAE 539	Advanced Materials	3
MAE 511	Advanced Dynamics I	3	MAE 540	Advanced Air Conditioning Design	3
MAE 513	Principles of Structural Vibration	3	MAE 541	Advanced Solid Mechanics I	3
MAE 515	Advanced Automotive Vehicle Dynamics	3	MAE 543	Fracture Mechanics	3
MAE 517	Advanced Precision Manufacturing for Products, Systems and Processes	3	MAE 544	Robot Mechanics and Control	3
			MAE 545	Metrology For Precision Manufacturing	3
			MAE 546	Photonic Sensor Applications in Structure	3
			MAE 550	Foundations Of Fluid Dynamics	3

MAE 551	Airfoil Theory	3
MAE 552	Introduction to Experimental Fluid Dynamics and Measurement Systems	3
MAE 553	Compressible Fluid Flow	3
MAE 554	Hypersonic Aerodynamics	3
MAE 555	Applications of Acoustic and Elastic Wave Propagation	3
MAE 558	Microfluidics and Nanofluidics	3
MAE 560	Computational Fluid Mechanics and Heat Transfer	3
MAE 561	Wing Theory	3
MAE 562	Physical Gas Dynamics	3
MAE 570	Space Exploration Systems	3
MAE 573	Hydrodynamic Stability and Transition	3
MAE 575	Advanced Propulsion Systems	3
MAE 577	Multiscale Two-phase Flow Simulations	3
MAE 589	Special Topics In Mechanical and Aerospace Engineering	1-6

**Other engineering technical electives (with departmental approval)**

Contact your MAE academic advisor for options

## Semester Sequence

This is a sample.

### First Year

Fall Semester		Hours
CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
E 101	Introduction to Engineering & Problem Solving <sup>2</sup>	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
Select one of the following Economics courses:		3
EC 205	Fundamentals of Economics	
EC 201	Principles of Microeconomics	
ARE 201	Introduction to Agricultural & Resource Economics	
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

**Hours 18**

### Spring Semester

CSC 113	Introduction to Computing - MATLAB	3
MA 241	Calculus II <sup>1</sup>	4
PY 205	Physics for Engineers and Scientists I <sup>1</sup>	3
PY 206	Physics for Engineers and Scientists I Laboratory <sup>1</sup>	1
E 102	Engineering in the 21st Century	2
GC 120	Foundations of Graphics	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> )		1

**Hours 17**

### Second Year

#### Fall Semester

MA 242	Calculus III	4
MAE 200	Introduction to Mechanical Engineering Design	1
PY 208	Physics for Engineers and Scientists II	3
PY 209	Physics for Engineers and Scientists II Laboratory	1
MAE 206	Engineering Statics <sup>2</sup>	3
ST 370 or ST 371	Probability and Statistics for Engineers or Introduction to Probability and Distribution Theory	3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3

**Hours 18**

#### Spring Semester

MA 341	Applied Differential Equations I	3
MAE 208	Engineering Dynamics <sup>2</sup>	3
MAE 201	Engineering Thermodynamics I <sup>2</sup>	3
MAE 214	Solid Mechanics <sup>2</sup>	3
MAE 305	Mechanical Engineering Laboratory I	1
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3

**Hours 16**

### Third Year

#### Fall Semester

ENG 331	Communication for Engineering and Technology	3
MAE 308	Fluid Mechanics	3
MAE 315	Dynamics of Machines	3
MAE 306	Mechanical Engineering Laboratory II	1
MAE 302	Engineering Thermodynamics II	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>
<b>Spring Semester</b>	
MAE 310 Heat Transfer Fundamentals	3
ECE 331 Principles of Electrical Engineering	3
MSE 200 Mechanical Properties of Structural Materials	3
MAE 316 Strength of Mechanical Components	3
Technical Elective (p. 2)	3
<b>Hours</b>	<b>15</b>
<b>Fourth Year</b>	
<b>Fall Semester</b>	
MAE 435 Principles of Automatic Control	3
MAE 405 Controls Lab	1
ISE 311 Engineering Economic Analysis	3
Select one of following ME Senior Design Part 1:	3
MAE 415 Mechanical Engineering Design I (This course should be followed by MAE 416)	
MAE 482 Engineering Entrepreneurship and New Product Development I (This course should be followed by MAE 483)	
Technical Elective (p. 2)	3
<b>Hours</b>	<b>13</b>
<b>Spring Semester</b>	
Select one of following ME Senior Design Part 2 based on Senior Design Part 1 choice:	4
MAE 416 Mechanical Engineering Design II	
MAE 483 Engineering Entrepreneurship and New Product Development II and Engineering Entrepreneurship Senior Design Lab	
MAE 484	
Technical Elective (p. 2)	3
Ethics (p. 2)GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )	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>13</b>
<b>Total Hours</b>	<b>126</b>

<sup>1</sup> Courses required for Change of Degree Audit (CODA). A grade of C or higher is required.

<sup>2</sup> A grade of C- or higher is required, E 115 requires satisfactory completion (S).