

# Engineering (BS): Mechanical Engineering Systems Concentration

The Mechanical Engineering Systems concentration offers a solid foundation in mechanical engineering principles, including structural mechanics, materials, fluid mechanics, dynamics, vibrations, controls, thermal sciences, mechanical design, and thermal design. Mechanical engineering courses are taught by nationally recognized faculty from the Raleigh campus.

On-site NC State faculty teach the systems engineering content, conduct all laboratory experiences, and direct students in the two-semester capstone design experience where they are partnered with an industry sponsor to design a solution to a real-world problem. Hands-on laboratory exercises and design-build projects each semester allow students to explore and experience theoretical concepts learned in their courses and practice important modern skills such as manual and computerized measurement techniques, data acquisition and analysis, design of experiments, and technical communications.

Training in formal systems engineering prepares students to understand and work through the broad, complex issues involved with integrated systems. Training in mechanical engineering equips students with the skills and confidence required to understand and solve detailed technical problems. Students with this unique combination of skills are well-prepared to meet both the technical and non-technical challenges of today's engineering workplace.

## Plan Requirements

Code	Title	Hours	Counts towards
<b>College Requirements</b>			
E 101	Introduction to Engineering & Problem Solving	1	
EC 205	Fundamentals of Economics	3	
or EC 201	Principles of Microeconomics		
or ARE 201	Introduction to Agricultural & Resource Economics		
<b>Math</b>			
MA 141 & MA 241 & MA 242	Calculus I and Calculus II and Calculus III	12	
MA 341	Applied Differential Equations I	3	
MA 305	Introductory Linear Algebra and Matrices	3	
<b>Sciences</b>			

CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
<b>Major</b>		
MAE 201	Thermal-Fluid Sciences	3
MAE 206	Engineering Statics	3
MAE 208	Engineering Dynamics	3
MAE 214	Solid Mechanics	3
MAE 308	Fluid Mechanics	3
MAE 310	Heat Transfer Fundamentals	3
MAE 315	Fundamentals of Vibrations	3
MAE 316	Strength of Mechanical Components	3
MAE 412	Design of Thermal System	3
MAE 413	Design of Mechanical Systems	3
MAE 435	Principles of Automatic Control	3
MES 200	Introduction to Engineering Systems	2
MES 201	Engineering Systems Lab 1	2
MES 300	Systems Engineering	3
MES 301	Engineering Systems Junior Design Lab	2
MES 302	Mechanical Engineering Systems Lab 1	2

MES 400	Mechanical Engineering Systems Lab 2	2
MES 401	MES Capstone Design I	3
MES 403	MES Capstone Design II	3
<b>Other Major</b>		
CSC 111	Introduction to Computing: Python	3
or CSC 113	Introduction to Computing - MATLAB	
or CSC 116	Introduction to Computing - Java	
GC 120	Foundations of Graphics	3
ECE 331	Principles of Electrical Engineering	3
ENG 331	Communication for Engineering and Technology	3
MSE 201	Structure and Properties of Engineering Materials	3
Engineering Ethics:		3
PHI 214	Issues in Business Ethics	
or PHI 221	Contemporary Moral Issues	
or PHI 375	Ethics	
<b>GEP Courses</b>		
ENG 101	Academic Writing and Research	4
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> )		3
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> )		5

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>124</b>

Semester Sequence

**First Year**

<b>Fall Semester</b>		<b>Hours</b>
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory <sup>2</sup>	4
E 101	Introduction to Engineering & Problem Solving <sup>1</sup>	1
ENG 101	Academic Writing and Research <sup>1</sup>	4
MA 141	Calculus I <sup>2</sup>	4
GC 120	Foundations of Graphics	3
<b>Hours</b>		<b>16</b>

**Spring Semester**

MA 241	Calculus II <sup>2</sup>	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory <sup>2</sup>	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
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**		1
EC 205	Fundamentals of Economics	3
MA 305	Introductory Linear Algebra and Matrices	3
<b>Hours</b>		<b>16</b>

**Second Year**

**Fall Semester**

MAE 206	Engineering Statics <sup>1</sup>	3
MSE 201	Structure and Properties of Engineering Materials	3
MA 242	Calculus III	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
MES 200	Introduction to Engineering Systems	2
<b>Hours</b>		<b>16</b>

**Spring Semester**

MAE 208	Engineering Dynamics <sup>1</sup>	3
MAE 214	Solid Mechanics <sup>1</sup>	3
MA 341	Applied Differential Equations I	3
MES 201	Engineering Systems Lab 1	2

CSC 111 or CSC 113 or CSC 116	Introduction to Computing: Python or Introduction to Computing - MATLAB or Introduction to Computing - Java	3
Select one of the following Ethics courses:		3
PHI 214	Issues in Business Ethics	
PHI 221	Contemporary Moral Issues	
PHI 375	Ethics	
<b>Hours</b>		<b>17</b>
<b>Third Year</b>		
<b>Fall Semester</b>		
MAE 201	Thermal-Fluid Sciences <sup>1</sup>	3
MAE 308	Fluid Mechanics	3
MAE 315	Fundamentals of Vibrations	3
MES 301	Engineering Systems Junior Design Lab	2
ENG 331	Communication for Engineering and Technology	3
<b>Hours</b>		<b>14</b>
<b>Spring Semester</b>		
MAE 316	Strength of Mechanical Components	3
MES 300	Systems Engineering	3
MAE 435	Principles of Automatic Control	3
MES 302	Mechanical Engineering Systems Lab 1	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
<b>Hours</b>		<b>14</b>
<b>Fourth Year</b>		
<b>Fall Semester</b>		
MAE 413	Design of Mechanical Systems ((Mech. Engr. Analysis)) <sup>1</sup>	3
MAE 310	Heat Transfer Fundamentals	3
MES 401	MES Capstone Design I	3
MES 400	Mechanical Engineering Systems Lab 2	2
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> )		3
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
<b>Hours</b>		<b>17</b>
<b>Spring Semester</b>		
MAE 412	Design of Thermal System <sup>1</sup>	3
MES 403	MES Capstone Design II	3
ECE 331	Principles of Electrical Engineering	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 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> )		2-3
<b>Hours</b>		<b>14</b>
<b>Total Hours</b>		<b>124</b>

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

<sup>2</sup> A grade of C (2.0) or higher is required.

## Career Opportunities

Graduates of the Mechanical Engineering Systems concentration are highly recruited with most graduates securing full-time employment before graduation. Alumni work as mechanical engineers, design engineers, manufacturing engineers, support equipment engineers, test equipment engineers, systems engineers, aerospace engineers, HVAC engineers, program analysts, and program managers. Many alumni have continued their education through graduate programs at a variety of universities, including NC State. Mechanical Engineering Systems alumni work for companies such as: Fleet Readiness Center East, Department of Defense Contractors, Lockheed Martin, GE Nuclear, US Army Futures Command, Duke Energy, Parker Boats and Toyota.

## Career Titles

- Aeronautical & Aerospace Engineer
- Aerospace Engineering Technician
- Agricultural Engineer
- Airport Engineer
- Automotive Engineer
- Biomedical Engineer
- Ceramic Engineer
- Chemical Engineer
- Civil Engineer
- Civil Engineering Technician
- Clinical Data Managers
- Computer Network Architects
- Computer Systems Engineer
- Cost Analysis Engineer
- Cost Estimator
- Electronics Engineer
- Energy Engineer
- Engineering Professor
- Environmental Engineer
- Factory Layout Engineer
- Fire Prevention Engineer
- Human Factors Engineers and Ergonomists
- Industrial Engineer
- Industrial Engineering Technician
- Industrial Safety and Health Engineer
- Irrigation Engineer
- Logistics Engineers
- Marine Engineer
- Marine Surveyor
- Materials Engineer
- Mechanical Engineer
- Mechanical Engineering Technician
- Meteorologist
- Mining Engineer
- Model Maker
- Natural Sciences Managers
- Nuclear Engineer
- Nuclear Fuels Research Engineer
- Operating Engineer

- Petroleum Engineer
- Photogrammetrist
- Physicist
- Product Safety Engineer
- Quality Control Managers
- Radiation Protection Engineer
- Sanitary Engineer
- Ship Engineers
- Software Developers - Applications
- Soil Engineer
- Solar Energy Systems Designer
- Solar Energy Systems Engineers
- Sound Engineering Technicians
- Structural Engineer
- Surveying Technicians
- Surveyor
- Sustainability Specialists
- Tool and Machine Designer
- Transportation Engineer
- Urban and Regional Planner
- Wind Energy 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.