

# Mechanical Engineering, B.S.M.E.

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## Degree Offered

- Bachelor of Science in Mechanical Engineering

## Nature of the Program

Mechanical engineering is one of the largest technical professions with a history of significant contributions to industrial development since the dawn of human civilization. The history of technology is replete with stories of successful applications of ideas and concepts from mechanical engineering that have brought tremendous prosperity to industrialized nations starting with the industrial revolution. Mechanical engineers also play a vital role in maintaining leadership in technology to insure the survival and growth of an industrialized society.

In order to prepare students for the challenges awaiting them in the real world, the Mechanical Engineering Department at WVU Tech offers a practice-oriented education with strong emphasis on hands-on experience at all levels of its BSME program. The curriculum is designed to develop the skills necessary to succeed in a field that is both challenging and rewarding. The Mechanical Engineering Program includes sequential courses in several areas, such as English, mathematics, chemistry, physics, humanities, computer science, general engineering science and foundation courses in mechanical engineering such as thermodynamics, machine design, heat transfer, mechanical vibrations, control systems and materials science. Technical electives in thermal and mechanical systems are included in the program to enable graduates to pursue special areas of interest.

Practicing mechanical engineers consider these courses as essential for a sound mechanical engineering curriculum. They are also mandated by the ABET, the national organization that accredits engineering programs in the United States. The Mechanical Engineering curriculum is designed to include meaningful design experience in several of the required and elective courses. Students develop analytical and design skills systematically by successfully completing sequential courses such as Statics, Dynamics, Mechanics of Materials, Dynamics of Machines, Machine Design and Systems Design 1 and 2. Open - ended, multiple - solution design concept is incorporated across the curriculum starting with Mechanics of Materials in their sophomore year and ending with two capstone design courses during their senior year. In the capstone design courses, students learn how to apply the previously acquired knowledge in science, technology, humanities, communications, ethics, economics, etc.

The Mechanical Engineering faculty also recognizes the dynamic nature of modern technology in which advances are inevitable and the need for our students to be prepared to meet these challenges. The curriculum is therefore under constant review, and changes are introduced in response to the changing needs of industry and the job market.

## Departmental Mission

The mission of the Mechanical Engineering Department at WVU Tech is to produce high quality mechanical engineers with the best possible education that will enable them to become competent members of the profession able to handle the most challenging jobs. The Mechanical Engineering Department intends to fulfill this mission by maintaining high academic quality that insures continued ABET accreditation.

## Departmental Goals

The Mechanical Engineering faculty is committed to the following goals:

- Provide an atmosphere of dedicated teaching and support services to the students with the best possible classroom instruction, counseling, academic planning, career guidance and personal attention to facilitate growth and success in academic and professional work.
- Provide quality learning tools and an academic environment that produces technically competent mechanical engineers who are able to meet the needs of employers from government, industry and business.
- Encourage and nurture students' interest in engineering as a profession.
- Help students develop self-motivation, good work habits, personal discipline, and the skills needed to be a professionally successful member of society.

## Educational Objectives

The following Educational Objectives have been adopted by the faculty of the Mechanical Engineering Department. Graduates of the WVU Tech Mechanical Engineering program:

- Are successful in the practice of mechanical engineering.
- Advance to positions of technical and/or managerial leadership.
- Are successful in graduate studies, if they choose to pursue advanced education.
- Are able to obtain professional registration, if they choose to, after appropriate professional experience.
- Are dedicated to life-long learning in their professional career.

## Assessment

The Mechanical Engineering Program at WVU Tech has a multi-faceted assessment process in place which includes: students' classwork and portfolios such as design projects; course evaluations; faculty evaluations; exit surveys of graduating seniors; alumni surveys; advisory board surveys; employer surveys; placement data of graduates; and the results of the Fundamentals of Engineering (FE) Examination. The feedback from these sources is continuously used by the Mechanical Engineering faculty to update the curriculum and to make the changes necessary to maintain or enhance the quality of the program.

## General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef/>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
<b>General Education Foundations</b>		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

## Curriculum Requirements

Code	Title	Hours
WVUE 191	First Year Seminar	1
DRET 120	Drafting 1	2
<b>GEF Elective Requirements (5, 6, and 7)</b>		<b>9</b>
ENGL 101 & ENGL 102	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research (GEF 1)	6
WRIT 305	Technical Writing	3
MATH 155	Calculus 1 (GEF 3)	4
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 8)	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 2)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
ECON 401	Managerial Economics (GEF 4)	3
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
ENGR 111	Software Tools for Engineers	3
ENGR 401	Senior Engineering Seminar	1
MAE 201	Applied Engineering Analysis	3

MAE 240	Manufacturing Processes	3
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 320	Thermodynamics	3
MAE 321	Applied Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 332	Experimental Methods	1
MAE 333	Mechanical Measurements	1
MAE 340	Vibrations	3
MAE 342	Dynamics of Machines	3
MAE 405	Senior Mechanical Engineering Lab	1
MAE 410	Materials Science (GEF 2)	4
MAE 419	Heat Transfer Lab	1
MAE 423	Heat Transfer	3
MAE 454	Machine Design and Manufacturing	3
MAE 455	Computer Aided Drafting and Design	3
MAE 456 & 456L	Computer-Aided Design and Finite Element Analysis and Computer-Aided Design and Finite Element Analysis Laboratory	3
MAE 460	Automatic Controls	3
MAE 480	System Design 1	3
MAE 481	Systems Design 2	3
<b>Technical Electives (see below)</b>		<b>6</b>
Total Hours		125

## Technical Electives

Code	Title	Hours
<b>Mechanical, Structural, and Energy Oriented</b>		
MAE 407	Power Plant Engineering	3
MAE 425	Internal Combustion Engines	3
MAE 427	Heating, Ventilating, and Air Conditioning	3
MAE 428	Aerodynamics	3
MAE 429	Theory of Turbomachines	3
MAE 440	Industrial Hydraulics:Components and Circuits Design	0 or 3
MAE 463	Advanced Machine Design	3
MAE 493	Special Topics (Applied Computational Fluid Dynamics)	3
MAE 493	Special Topics (Student Engineering Practice)	3
MAE 493	Special Topics (Topics in CAD/CAM/CAE)	3
CE 361	Structural Analysis 1	4
CE 421	Hydraulic Engineering	4
EE 427	Introduction to Robotics	3
EE 335 & 335L	Electromechanical Energy Conversion and Systems and Electromechanical Energy Conversion and Systems Laboratory	4
EE 493	Special Topics (Alternative Energy Resources)	3
<b>Digital Hardware and Software Oriented</b>		
ENGR 493	Special Topics (Microprocessors for Non-Electrical Engineers/Comp. Engineers)	3
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory	4
GNET 410	C++ Programming for Technology	3
ELET 493	Special Topics (C Programming for Engineering Applications)	3
<b>Manufacturing Oriented</b>		
ELET 436	Programmable Logic Controllers	4

INDT 302	Industrial Safety	3
INDT 308	Automated Manufacturing	3
INDT 410	Plant Equipment and Maintenance	3
GNET 412	Project Management	3
<b>Math Oriented</b>		
MATH 378	Discrete Mathematics	3
MATH 441	Applied Linear Algebra	3
MATH 448	Probability and Statistics	3
<b>Biomechanics Oriented</b>		
BIOL 230	Human Anatomy and Physiology 1	4
BIOL 440	Comparative Anatomy	4
CHE 493	Special Topics (Materials in Biosystems)	3

## Suggested Plan of Study

### First Year

Fall	Hours	Spring	Hours
ENGL 101 (GEF 1)		3 ENGL 102 (GEF 1)	3
MATH 155 (GEF 3)		4 MATH 156 (GEF 8)	4
CHEM 115 & 115L (GEF 8)		4 ENGR 111	3
DRET 120		2 MAE 241	3
WVUE 191		1 GEF 5	3
		14	16

### Second Year

Fall	Hours	Spring	Hours
MATH 251		4 MATH 261	4
PHYS 111 (GEF 2)		4 PHYS 112 (GEF 8)	4
MAE 240		3 MAE 201	3
MAE 242		3 MAE 320	3
MAE 243		3 MAE 331	3
		17	17

### Third Year

Fall	Hours	Spring	Hours
EE 221 & 221L		4 WRIT 305	3
MAE 321		3 ECON 401 (GEF 4)	3
MAE 333		1 MAE 332	1
MAE 342		3 MAE 340	3
MAE 480		3 MAE 419	1
		MAE 423	3
		MAE 460	3
		14	17

### Fourth Year

Fall	Hours	Spring	Hours
MAE 405		1 ENGR 401	1
MAE 455		3 MAE 410	4
MAE 480		3 MAE 456 & 456L	3
Technical Elective		3 MAE 481	3
GEF 6		3 Technical Elective	3

GEF 7

3

16

14

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Total credit hours: 125

## Major Learning Outcomes

### MECHANICAL ENGINEERING

Consistent with the mission of WVU Tech and in compliance with the ABET criteria, the Program emphasizes the development of a well-rounded mechanical engineer. Upon graduation they will be able to demonstrate:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- A recognition of the need for, and an ability to engage in life-long learning
- A knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.