Mechanical Engineering, B.S.M.E.

Degrees Offered

- Bachelor of Science in Mechanical Engineering (B.S.M.E.)
- Dual Degree in Aerospace and Mechanical Engineering
- Dual Degree in Mechanical and Robotics Engineering

Nature of the Program

Mechanical engineering is a broad technical discipline. It integrates knowledge of the physical sciences and mathematics for the design, construction, and manufacture, testing, analysis, use, and operation of a device, structure, a machine, a process, or a system in service to humanity. Its development parallels the growth of industry. Modern society needs mechanical engineers who have broad and deep training in the fundamentals of engineering and related sciences and who have developed versatility in analyzing and solving complex problems. The mechanical engineer must not only possess a high level of professional expertise but also have an appreciation for the impact of engineering solutions in a societal context, including ethical and economic considerations.

Mechanical engineers are problem-solvers who are scientifically informed and mathematically minded. The mechanical engineering curriculum prepares students to deal effectively with a broad range of engineering problems rather than with narrow specialties. Graduates find employment in a wide range of industries, government agencies, and educational institutions where they are concerned with many functions:

- The use and economic conversion of energy from natural sources into useful energy for power, light, heating, cooling, and transportation;
- The design and production of machines to lighten the burden of human work;
- The planning and development of systems for using energy machines and resources;
- The processing of materials into products useful to mankind; and
- The education and training of specialists who deal with mechanical systems.

The curriculum consists of a judicious combination of fundamentals, including mathematics and sciences, and practical laboratory experience which provides access to modern engineering tools. Mechatronics, which is a study of the interdependence between mechanical engineering and electrical/electronics engineering, is a key part of the mechanical engineering curriculum. Graduates will be able to critically analyze mechanical engineering problems and execute practical solutions. In addition to being able to function independently, it is expected that graduates will be able to function with effective written and oral communication within multidisciplinary teams and be prepared to address several issues such as environmental, social, and economic considerations due to a thorough education in the humanities, social sciences, ethics, safety, and professionalism.

While the undergraduate curriculum is sufficiently broad to permit graduates to select from a wide variety of employment opportunities, it contains sufficient depth to prepare students to enter graduate school to pursue advanced degrees. As modern science and engineering become more complex, the desirability of graduate-level preparation is being recognized by most advanced industries and government agencies.

Students can simultaneously pursue B.S. degrees in both aerospace engineering and mechanical engineering by completing additional courses.

Students who plan a career in medicine, dentistry, or related areas, but who desire a mechanical engineering degree before entering the appropriate professional school, may substitute eight hours (from a combination of biology and organic chemistry courses) for the required six hours of technical electives. This selection will help the student satisfy admission requirements to the professional schools in the health sciences.

The mechanical engineering program at WVU is administered by the faculty of the Department of Mechanical, Materials and Aerospace Engineering. The Bachelor of Science degree in mechanical engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, under the General Criteria and the Program Criteria for Mechanical Engineering.

Program Educational Objectives

It is expected that, within a few years of graduation (3 to 5 years), graduates will attain the following Program Educational Objectives (PEO's):

PEO-1. Proficiency in practicing one or more areas of mechanical engineering.

It is expected that after a few years of graduating (3 to 5 years), graduates will have consolidated professional proficiency as practitioners in at least one technical area of mechanical engineering, as reflected by the responsibilities and accomplishments of their professional practice.

PEO-2. Success in adapting to the demands of the workforce in the dynamic technological arena.

It is expected that, within a few years of graduation (3 to 5 years), graduates will have successfully adapted to the demands of the workforce in a dynamic technological arena through a professional practice that reflects high credentials or development of new technical skills and acumen for administrative functions.

PEO-3. Progress in their personal career development through professional service, continuing education and/or graduate studies.

It is expected that, within a few years of graduation (3 to 5 years), graduates will have made meaningful progress in their professional career, either by promotions to positions of higher responsibility with their employers, by participation in professional service activities, or by technical self-improvement through continuing education, graduate studies, and/or professional licensure.

PEO-4. Meaningful involvement in a team that tangibly contributes to industry and/or society through the engineering discipline.

It is expected that, within a few years of graduation (3 to 5 years), graduates will have the experience of being or having been members in a team of professionals successfully making tangible technical contributions to industry or society through an engineering discipline.

Study Abroad Opportunity

ROME, ITALY (PRIMARILY FOR JUNIOR YEAR ME AND AE UNDERGRADUATE STUDENTS)

All MMAE undergraduates are invited to consider spending the spring semester of their junior year studying abroad at the University of Rome Tor Vergata ("UTV", for short). This very successful program is taught fully in English at UTV to both Italian undergraduate engineering students and students from other countries all over the world. Through this program WVU students have the opportunity to earn credits towards their WVU BSME or dual BSME/BSAE degrees for a full semester of equivalent WVU engineering courses towards their degrees.

MEXICO (PRIMARILY FOR SENIOR YEAR ME AND AE UNDERGRADUATE STUDENTS)

Senior students in good standing in the MMAE Department have the opportunity to participate in the Industrial Outreach Program in Mexico (IOPM) during the summer of each year (June and July) to earn credits toward their BS degree requirements in the BSAE or BSME Degree; this program is also available for other engineering majors. In this program, students are teamed up with Mexican students from local universities and conduct meaningful engineering projects in industrial sites, working full time under the guidance and supervision of practicing industrial engineers and faculty members.

Click here to view the Suggested Plan of Study (p. 6)

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
General Education Foundations		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research	
or ENGL 103	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.

Degree Requirements

Students must meet the following criteria to qualify for a Bachelor of Science in Mechanical Engineering degree:

- Complete a minimum of 126 credit hours
- Satisfy WVU's undergraduate degree requirements
- Satisfy Statler College's undergraduate degree requirements (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policiestext)
- Complete all courses listed in the curriculum requirements with the required minimum grades

- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science courses with a grade of D+, D, or D- may apply towards a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, EMGT, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, MSEN, PDA, PNGE, ROBE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

Curriculum Requirements

Code	Title	Hours
University Requirements		16
Fundamentals of Engineering Requirements		5
Math and Science Requirements		28
Mechanical Engineering Program Requirements		77
Total Hours		126

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, 7		15
ENGR 191	First-Year Seminar	1
Total Hours		16

Fundamentals of Engineering Requirements

Code	Title	Hours
A minimum grade of C- is required in all Fundamentals of Engineering courses.		
ENGR 101	Engineering Problem Solving 1	2
Engineering Problem Solving (Select one of the following):		3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem Solving 2	
ENGR 103	Introduction to Nanotechnology Design	
MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
Total Hours		5

Math and Science Requirements

Code	Title	Hours
A minimum grade of C- is required in all Math and Science courses.		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 2B)	4
Calculus I (GEF 3):		4
MATH 155	Calculus 1	
MATH 156	Calculus 2 (GEF 8)	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 8)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
Total Hours		28

Mechanical Engineering Program Requirements

Code	Title	Hours
ECON 201	Principles of Microeconomics (GEF 4)	3
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
IENG 302	Manufacturing Processes	2
MAE 202	Sophomore Seminar	1
MAE 211 & 211L	Mechatronics and Mechatronics Laboratory	3
MAE 212L	Introduction to Computer Aided Design	1
MAE 216L	Intermediate Engineering Computation	1
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 316	Analysis of Engineering Systems	3
MAE 320	Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 342	Dynamics of Machines	3
MSEN 350	Materials Science	3
MAE 353	Intermediate Mechanics of Materials	3
MAE 423	Heat Transfer	3
MAE 456 & 456L	Computer-Aided Design and Finite Element Analysis and Computer-Aided Design and Finite Element Analysis Laboratory	3
MAE 471S	Principles of Engineering Design	3
MAE 472S	Engineering Systems Design	3
Technical Electives *		9
Area of Emphasis *		14-16
Dynamics & Controls (15 Total Hours)		
Energy Systems (15 Total Hours)		
Materials Science (14 Total Hours)		
Robotics (16 Total Hours)		
Total Hours		77

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Technical Elective courses must be unique from those required for the selected Area of Emphasis.

Mechanical Engineering Technical Electives

Code	Title	Hours
Mechanical Engineering Technical Electives		
Student must select technical elective courses that are different from courses required for their selected Area of Emphasis		
Students are limited to a total of 3 hours under MAE 491, MAE 495, and/or MAE 496		
Students may substitute one technical elective from the substitute technical electives		
Students may substitute two technical electives from the pre medical technical electives		
BMEG 340	Biomechanics	4
IENG 302L	Manufacturing Processes Laboratory	1
IENG 445	Project Management for Engineers	3
MAE 244L	Dynamics and Strength Laboratory	1
MSEN 351L	Materials Engineering Laboratory	1
MAE 271S	Mechanical and Aerospace Engineering Design 1	1
MAE 312	Introduction to Mechanical Design	3
MAE 321	Applied Thermodynamics	3
MAE 322L	Thermal and Fluids Laboratory	1

MAE 335	Incompressible Aerodynamics	3
MAE 336	Compressible Aerodynamics	3
MAE 345	Aerospace Structures	3
MSEN 354	Materials Processing and Manufacturing	3
MSEN 355	Mechanical and Physical Properties of Materials	3
MAE 371S	Mechanical and Aerospace Engineering Design 2	2
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	3
MAE 415S & MAE 417S	Balloon Satellite Project 1 and Balloon Satellite Project 2	3
MAE 422L	Energy Conversion Laboratory	1
MAE 425	Internal Combustion Engines	3
MAE 426	Flight Vehicle Propulsion	3
or MAE 478	Guided Missile Systems	
or MAE 484	Spacecraft Propulsion	
MAE 427	Heating, Ventilating, and Air Conditioning	3
MAE 430S	Microgravity Research 1	3
or MAE 431S	Microgravity Research 2	
MAE 432	Engineering Acoustics	3
MAE 433	Computational Fluid Dynamics	3
MAE 441	Gas Turbine Design and Durability	3
MAE 442	Mechanical Vibrations	3
MAE 446	Mechanics of Composite Materials	3
MAE 454	Machine Design and Manufacturing	3
MAE 459	Hybrid Electric Vehicle Propulsion and Control	3
MAE 460	Automatic Controls	3
MAE 473	Bioengineering	3
MAE 474S	UAV Design/Build/Fly Comp	1 to 3
MAE 491	Professional Field Experience	3
MAE 466	Spacecraft Dynamics	3
or MAE 476	Space Flight and Systems	
MAE 493	Special Topics	3
MAE 495	Independent Study	3
MAE 496	Senior Thesis	3
MSEN 449	Microscopy of Materials	3
MSEN 480	Crystallography and Crystals	3
MSEN 483	Thermodynamics and Kinetics of Materials	3
ROBE 313	Fundamentals of Robotic Systems	3
ROBE 412	Mobile Robotics	3
or MAE 412	Mobile Robotics	
ROBE 413	Robotic Manipulators	3
or MAE 413	Robotic Manipulators	
ROBE 414	Robot Autonomy	3
Any MAE 500 Level Course except MSEN 580 and MSEN 583		
Approved ENGR 493 Courses		

Substitute Technical Electives

Mechanical Engineering students may take one of the following courses with prior approval from the ME curriculum chair. Students may only take one of the substitute courses and must take the other technical elective from the list above.

Code	Title	Hours
MSEN 350	Materials Science	3
CHE 463	Polymer Composites Processing	3

CE 322	Hydrotechnical Engineering	3
CE 347 & 347L	Introduction to Environmental Engineering and Introduction to Environmental Engineering Laboratory	4
CE 443	Environmental Science and Technology	3
CE 463	Steel Design	3
CE 464	Timber Design	3
CPE 453	Data and Computer Communications	3
CS 430	Advanced Software Engineering	3
CS 440	Database Design and Theory	3
CS 455	Computer Architecture	3
EE 223 & 223L	Electrical Circuits and Electrical Circuits Laboratory	4
EE 327	Signals and Systems 1	3
EE 335 & 335L	Electromechanical Energy Conversion and Systems and Electromechanical Energy Conversion and Systems Laboratory	4
EE 345	Engineering Electromagnetics	3
EE 463	Digital Signal Processing Fundamentals	3
ENGR 310	Energy Engineering	3
IENG 377	Engineering Economy	3
IENG 405	Design for Manufacturability	3
MATH 441	Applied Linear Algebra	3
MATH 456	Complex Variables	3
MATH 465	Partial Differential Equations	3
PHYS 314	Introductory Modern Physics	4
PHYS 321	Optics	3
PHYS 332	Theoretical Mechanics 2	3
PHYS 333	Electricity and Magnetism 1	3
PHYS 451	Introductory Quantum Mechanics	3
PHYS 463	Nuclear Physics	3
PHYS 471	Solid State Physics	3

Pre-Medical Technical Electives

Students who plan a career in medicine, dentistry, or related area may substitute the following courses to count as the technical elective requirement.

Code	Title	Hours
Choose two of the following:		
CHEM 233 & 233L	Organic Chemistry 1 and Organic Chemistry 1 Laboratory	
CHEM 234 & 234L	Organic Chemistry 2 and Organic Chemistry 2 Laboratory	
BIOL 115 & 115L	Principles of Biology and Principles of Biology Laboratory	
BIOL 117 & 117L	Introductory Physiology and Introductory Physiology Laboratory	

Suggested Plan of Study

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L (GEF 2B)		4 ENGR 102	3
ENGL 101 (GEF 1)		3 MATH 156 (GEF 8)	4
ENGR 101		2 PHYS 111 & 111L (GEF 8)	4
ENGR 191		1 GEF 6	3

MATH 155 (GEF 3)	4	GEF 7	3
GEF 5	3		
	17		17

Second Year

Fall	Hours	Spring	Hours
MAE 202	1	ECON 201 (GEF 4)	3
MAE 211 & 211L	3	ENGL 102 (GEF 1)	3
MAE 212L	1	MAE 242	3
MAE 216L	1	MAE 243	3
MAE 241	3	MATH 261	4
MATH 251	4		
PHYS 112 & 112L (GEF 8)	4		
	17		16

Third Year

Fall	Hours	Spring	Hours
EE 221 & 221L	4	IENG 302	2
MAE 320	3	MAE 316	3
MAE 331	3	MAE 342	3
MAE 353	3	Technical Elective	3
MSEN 350	3	AOE Course	5
	16		16

Fourth Year

Fall	Hours	Spring	Hours
MAE 456 & 456L	3	MAE 423	3
MAE 471S	3	MAE 472S	3
Technical Elective	3	Technical Elective	3
AOE Course	3	AOE Course	3
AOE Course	3		
	15		12

Total credit hours: 126

Areas of Emphasis

- Dynamics & Controls (p. 7)
- Energy Systems (p. 8)
- Materials Science (p. 8)
- Robotics (p. 9)

DYNAMICS AND CONTROLS AREA OF EMPHASIS

Code	Title	Hours
IENG 302L	Manufacturing Processes Laboratory	1
MAE 244L	Dynamics and Strength Laboratory	1
MAE 322L	Thermal and Fluids Laboratory	1
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	3
MAE 442	Mechanical Vibrations	3
MAE 454	Machine Design and Manufacturing	3
MAE 460	Automatic Controls	3
Total Hours		15

ENERGY SYSTEMS AREA OF EMPHASIS

Code	Title	Hours
MAE 244L	Dynamics and Strength Laboratory	1
or MSEN 351L	Materials Engineering Laboratory	
MAE 321	Applied Thermodynamics	3
MAE 322L	Thermal and Fluids Laboratory	1
MAE 422L	Energy Conversion Laboratory	1
MAE 460	Automatic Controls	3
Select two of the following:		6
ARE 382	Agricultural and Natural Resources Law	
ARE 445	Energy Economics	
ARE 485	Economics of Water Resources and Energy	
EE 335	Electromechanical Energy Conversion and Systems	
EE 345	Engineering Electromagnetics	
FNRS 320	Sustainable Construction	
FNRS 421	Renewable Resources Policy and Governance	
GEOL 388	Introduction to Geochemistry	
IENG 433	Energy Efficiency and Sustainability	
MAE 425	Internal Combustion Engines	
MAE 426	Flight Vehicle Propulsion	
or MAE 478	Guided Missile Systems	
or MAE 484	Spacecraft Propulsion	
MAE 427	Heating, Ventilating, and Air Conditioning	
MAE 459	Hybrid Electric Vehicle Propulsion and Control	
PHYS 312	Oscillations and Thermal Physics	
PHYS 321	Optics	
PHYS 333	Electricity and Magnetism 1	
PHYS 334	Electricity and Magnetism	
PHYS 461	Thermodynamics and Statistical Mechanics	
POLS 338	Environmental Policy	
Total Hours		15

MATERIALS SCIENCE AREA OF EMPHASIS

Code	Title	Hours
IENG 302L	Manufacturing Processes Laboratory	1
MSEN 351L	Materials Engineering Laboratory	1
MSEN 354	Materials Processing and Manufacturing	3
MSEN 355	Mechanical and Physical Properties of Materials	3
Select two of the following: *		6-7
CHEM 116 & 116L	Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
CHEM 233 & 233L	Organic Chemistry 1 and Organic Chemistry 1 Laboratory	
CE 310	Civil Engineering Materials	
IENG 403	Additive Manufacturing Technology & Materials	
MSEN 449	Microscopy of Materials	
MSEN 480	Crystallography and Crystals	
MSEN 483	Thermodynamics and Kinetics of Materials	
MSEN 493	Special Topics	
Total Hours		14

*

One course must be at the upper-division (300- or 400-level).

ROBOTICS AREA OF EMPHASIS

Code	Title	Hours
MAE 244L	Dynamics and Strength Laboratory	1
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	3
MAE 442	Mechanical Vibrations	3
MAE 460	Automatic Controls	3
ROBE 313	Fundamentals of Robotic Systems	3
Select one of the following:		3
ROBE 412	Mobile Robotics	
ROBE 413	Robotic Manipulators	
ROBE 414	Robot Autonomy	
Total Hours		16

Accelerated Program

- BSME Mechanical Engineering and MSME Mechanical Engineering (p. 9)

Accelerated Bachelor's/Master's in Mechanical Engineering

Students must fulfill all degree requirements for the B.S.M.E. in Mechanical Engineering and all the requirements of the M.S.M.E. in Mechanical Engineering. Students must also meet all the requirements of the ABM.

ABM REQUIREMENTS

Code	Title	Hours
Undergraduate Coursework		117
Shared Bachelor's/Master's Coursework		9
Graduate Coursework		21
Total Hours		147

SHARED COURSEWORK CURRICULUM REQUIREMENTS

Code	Title	Hours
Courses completed must be at the 400 or 500 level.		
See BSME and MSME for list of elective course options.		
Courses:		
Technical Elective		3
Technical Elective		3
Technical Elective		3
Total Hours		9

SUGGESTED PLAN OF STUDY

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical ABM B.S.M.E. & M.S.M.E. degree program completes degree requirements in five year is as follows.

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L (GEF 2B)	4	ENGR 102	3
ENGL 101 (GEF 1)	3	MATH 156 (GEF 8)	4
ENGR 101	2	PHYS 111 & 111L (GEF 8)	4

ENGR 191	1	GEF 6	3
MATH 155 (GEF 3)	4	GEF 7	3
GEF 5	3		
	17		17

Second Year

Fall	Hours	Spring	Hours
MAE 202	1	MAE 242	3
MAE 211 & 211L	3	MAE 243	3
MAE 212L	1	MAE 320	3
MAE 216L	1	MATH 261	4
MAE 241	3	ENGL 102	3
MATH 251	4	AOE Course	2
PHYS 112 & 112L (GEF 8)	4		
	17		18

Third Year

Fall	Hours	Spring	Hours
EE 221 & 221L	4	ECON 201	3
MAE 316	3	IENG 302	2
MAE 331	3	MAE 342	3
MAE 353	3	AOE Course	3
MSEN 350	3	AOE Course	3
	16		14

Fourth Year

Fall	Hours	Spring	Hours
MAE 456 & 456L	3	MAE 423	3
MAE 471S	3	MAE 472S	3
Technical Electives*	3	Technical Electives*	6
AOE Course	3		
AOE Course	3		
	15		12

Fifth Year

Fall	Hours	Spring	Hours
MAE 697	3	MAE 697	3
Core Area Course	3	Core Area Course	3
Mathematics Requirement Course	3	Additional Courses	3
		Mathematics Requirement Course	3
	9		12

Total credit hours: 147

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Indicates that this course will be shared with the MS requirements.

+

See BSME degree for list of area of emphasis courses.

++

See MSME for list of core area and mathematics requirement courses.

Dual Degree Programs

- B.S.A.E. Aerospace Engineering and B.S.M.E. Mechanical Engineering (p. 11)
- B.S.M.E. Mechanical Engineering and B.S. Robotics Engineering (p. 14)

B.S.A.E. Aerospace Engineering and B.S.M.E. Mechanical Engineering

In the modern technical marketplace, college graduates must attain every competitive edge possible to enhance their career opportunities. One way to do this is with a master's degree following the bachelor's degree; however, this often results in more specialization than may be desired and may take an additional two years. Another option is to broaden the undergraduate experience, thus opening more opportunities for the graduate. The dual B.S.A.E./B.S.M.E. program awards both the aerospace engineering and mechanical engineering degrees at the completion of a planned curriculum.

Students under this option pursue the B.S.A.E. and B.S.M.E. degrees simultaneously. This can be accomplished by declaring intentions as a freshman requesting admission to the programs. Maximum scheduling flexibility will result when this decision is made as early as possible in the student's academic career. Dual-degree students must take all courses listed in the 150-hour dual curriculum under the Major tab and satisfy the other requirements of the two individual programs.

Degree Requirements

Students must meet the following criteria to qualify for a Bachelor of Science in Aerospace Engineering and Bachelor of Science in Mechanical Engineering degree:

- Complete a minimum of 150 credit hours
- Satisfy WVU's undergraduate degree requirements
- Satisfy Statler College's undergraduate degree requirements (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policiestext)
- Complete all courses listed in the curriculum requirements with the required minimum grades
- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science course with a grade of D+, D, or D- may apply toward a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, PDA, PNGE, ROBE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at West Virginia University. The Overall GPA is computed based on all work taken at West Virginia University and transfer work.

Curriculum Requirements

Code	Title	Hours
University Requirements		16
Fundamentals of Engineering Requirements		5
Math and Science Requirements		28
Aerospace Engineering and Mechanical Engineering Program Requirements		101
Total Hours		150

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, and 7		15
ENGR 191	First-Year Seminar	1
Total Hours		16

Fundamentals of Engineering Requirements

Code	Title	Hours
A minimum grade of C- is required in all Fundamentals of Engineering courses.		
ENGR 101	Engineering Problem Solving 1	2
Engineering Problem Solving (Select one of the following):		3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem Solving 2	
ENGR 103	Introduction to Nanotechnology Design	
MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
Total Hours		5

Math and Science Requirements

Code	Title	Hours
A minimum grade of C- is required in all Math and Science courses.		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 2B)	4
Calculus I: (GEF 3, minimum grade of C-)		4
MATH 155	Calculus 1	
MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus	
MATH 156	Calculus 2 (GEF 8, minimum grade of C-)	4
MATH 251	Multivariable Calculus (minimum grade of C-)	4
MATH 261	Elementary Differential Equations (minimum grade of C-)	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (minimum grade of C-)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
Total Hours		28

Aerospace Engineering and Mechanical Engineering Program Requirements

Code	Title	Hours
ECON 201	Principles of Microeconomics (GEF 4)	3
EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
IENG 302	Manufacturing Processes	2
MAE 202	Sophomore Seminar	1
MAE 211 & 211L	Mechatronics and Mechatronics Laboratory	3
MAE 212L	Introduction to Computer Aided Design	1
MAE 215	Introduction to Aerospace Engineering	3
MAE 216L	Intermediate Engineering Computation	1
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 316	Analysis of Engineering Systems	3
MAE 320	Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 335	Incompressible Aerodynamics	3
MAE 336	Compressible Aerodynamics	3
MAE 342	Dynamics of Machines	3
MAE 345	Aerospace Structures	3
MAE 353	Intermediate Mechanics of Materials	3

MAE 423	Heat Transfer	3
MAE 434 & 434L	Experimental Aerodynamics and Experimental Aerodynamics Laboratory	3
MAE 456 & 456L	Computer-Aided Design and Finite Element Analysis and Computer-Aided Design and Finite Element Analysis Laboratory	3
Choose course based on Mechanical AOE selection:		3
MAE 460	Automatic Controls (required if taking Materials Science and Engineering AOE)	
AE Technical Elective (required for	Energy Systems, Robotics, Dynamics and Control AOEs) [+]	
MAE 471S	Principles of Engineering Design	3
MAE 472S	Engineering Systems Design	3
MAE 476	Space Flight and Systems	3
MSEN 350	Materials Science	3
Aerospace Engineering Area of Emphasis		12
Aeronautical Engineering (12 Total Hours)		
Astronautical Engineering (12 Total Hours)		
Mechanical Engineering Area of Emphasis		14-16
Dynamics and Controls (15 Total Hours)		
Energy Systems (15 Total Hours)		
Materials Science (14 Total Hours)		
Robotics (16 Total Hours)		
Total Hours		101

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See BSAE degree (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/departmentofmechanicalandaerospace/aerospace/#majortext) for list of electives

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See BSME degree (p. 2) for list of electives

Suggested Plan of Study

It is important for students to take courses in the order specified as close as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.A.E./B.S.M.E. degree program that completes degree requirements in four and a half years is listed below.

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L	4	MAE 102	3
ENGL 101 (GEF 1)	3	MATH 156 (GEF 8)	4
ENGR 101	2	PHYS 111 & 111L (GEF 8)	4
ENGR 191	1	GEF Elective 6	3
MATH 155 (GEF 3)	4	GEF Elective 7	3
GEF Elective 5	3		
	17		17

Second Year

Fall	Hours	Spring	Hours
MAE 202*	1	ENGL 102	3
MAE 212L	1	MAE 211 & 211L	3
MAE 215	3	MAE 242	3
MAE 216L	1	MAE 243	3
MAE 241	3	MATH 261	4
MATH 251 (GEF 8)	4		

PHYS 112 & 112L	4		
	17		16

Third Year

Fall	Hours	Spring	Hours
MAE 316	3	ECON 201	3
MAE 320	3	EE 221 & 221L	4
MAE 331	3	MAE 336	3
MAE 335*	3	MAE 342	3
MAE 353	3	MAE 476	3
MSEN 350	3	AE AOE Course	3
	18		19

Fourth Year

Fall	Hours	Spring	Hours
MAE 434 & 434L*	3	IENG 302	2
AE AOE Courses	6	MAE 345*	3
ME AOE Course	5	AE AOE Course	3
MAE 471S	3	ME AOE Courses	3
		MAE 472S	3
	17		14

Fifth Year

Fall	Hours
MAE 423	3
MAE 456 & 456L	3
MAE 460 (or AE Technical Elective)	3
ME AOE Courses	6
	15

Total credit hours: 150

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Courses taught in given semester.

B.S.M.E. Mechanical Engineering and B.S. Robotics Engineering

Degree Requirements

Students must meet the following criteria to qualify for a Bachelor of Science in Mechanical Engineering and a Bachelor of Science in Robotics Engineering degree:

- Complete a minimum of 150 credit hours
- Satisfy WVU's undergraduate degree requirements
- Satisfy Statler College's undergraduate degree requirements (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policiestext)
- Complete all courses listed in the curriculum requirements with the required minimum grades
- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science courses with a grade of D+, D, or D- may apply towards a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, EMGT, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, MPGE, MSEN, PDA, PNGE, ROBE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

Curriculum Requirements

Code	Title	Hours
University Requirements		16
Fundamentals of Engineering Requirements		2
Math and Science Requirements		28
Mechanical Engineering and Robotics Engineering Program Requirements		104-109
Total Hours		150-155

University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, and 7		15
ENGR 191	First-Year Seminar	1
Total Hours		16

Fundamentals of Engineering Requirements

Code	Title	Hours
A minimum grade of C- is required in all Fundamentals of Engineering courses.		
ENGR 101	Engineering Problem Solving 1	2
Total Hours		2

Math and Science Requirements

Code	Title	Hours
A minimum grade of C- is required in all Math and Science courses.		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory (GEF 2B)	4
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
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory (GEF 8)	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory (GEF 8)	4
Total Hours		28

Mechanical Engineering and Robotics Enginering Program Requirements

Code	Title	Hours
CPE 271 & 271L	Introduction to Digital Logic Design and Digital Logic Laboratory	4
CPE 310 & 310L	Microprocessor Systems and Microprocessor Systems Laboratory	4
CS 110 & 110L	Introduction to Computer Science and Introduction to Computer Science Laboratory	4
CS 111 & 111L	Introduction to Data Structures and Introduction to Data Structures Laboratory	4
CS 350	Computer System Concepts	3
ECON 201	Principles of Microeconomics (GEF 4)	3

EE 221 & 221L	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
EE 251 & 251L	Digital Electronics and Digital Electronics Laboratory	4
IENG 302	Manufacturing Processes	2
MAE 202	Sophomore Seminar	1
MAE 211 & 211L	Mechatronics and Mechatronics Laboratory	3
MAE 212L	Introduction to Computer Aided Design	1
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 316	Analysis of Engineering Systems	3
MAE 320	Thermodynamics	3
MAE 331	Fluid Mechanics	3
MAE 342	Dynamics of Machines	3
MAE 353	Intermediate Mechanics of Materials	3
MAE 423	Heat Transfer	3
MAE 456 & 456L	Computer-Aided Design and Finite Element Analysis and Computer-Aided Design and Finite Element Analysis Laboratory	3
MSEN 350	Materials Science	3
ROBE 313	Fundamentals of Robotic Systems	3
ROBE 412	Mobile Robotics	3
ROBE 413	Robotic Manipulators	3
ROBE 414	Robot Autonomy	3
ROBE 471S	Principles of Engineering Design	3
ROBE 472S	Engineering Systems Design	3
Focus Areas		**16-21**
Option A (16 Credits)		
MAE 244L	Dynamics and Strength Laboratory	
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	
MAE 442	Mechanical Vibrations	
MAE 460	Automatic Controls	
Technical Electives (6 credits)		
Option B (21 Credits)		
ME Dynamics and Controls AoE (15 Credits) [+]		
Technical Electives (6 Credits) [*]		
Option C (21 Credits)		
Energy Systems AoE (15 Credits) [+]		
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	
Technical Electives (3 credits) [*]		
Option D (20-21 Credits)		
Materials Science AoE (14-15 Credits) [+]		
MAE 411 & 411L	Advanced Mechatronics and Advanced Mechatronics Laboratory	
MAE 460	Automatic Controls	
Total Hours		104-109

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See BSME degree (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/departmentofmechanicalandaerospace/mechanical/#majortext) for list of electives
See BS Robotics (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/departmentofmechanicalandaerospace/robe/#majortext) degree for list of electives

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See BSME degree (http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/departmentofmechanicalandaerospace/mechanical/#areasofemphasistext) for Area of Emphasis (AoE) options

Suggested Plan of Study

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical B.S.M.E / B.S. Robotics degree program that completes degree requirements in four and a half years is listed below.

First Year

Fall	Hours	Spring	Hours
CHEM 115 & 115L (GEF 2)	4	CS 111 & 111L	4
CS 110 & 110L	4	MATH 156 (GEF 8)	4
ENGL 101 (GEF 1)	3	PHYS 111 & 111L (GEF 8)	4
ENGR 101	2	GEF 5, 6, or 7	3
ENGR 191	1	GEF 5, 6, or 7	3
MATH 155 (GEF 3)	4		
	18		18

Second Year

Fall	Hours	Spring	Hours
MAE 202	1	EE 221 & 221L	4
MAE 212L	1	ENGL 102 (GEF 1)	3
MAE 241	3	MAE 211 & 211L	3
MATH 251 (GEF 8)	4	MAE 242	3
PHYS 112 & 112L	4	MATH 261	4
GEF 5, 6, or 7	3		
	16		17

Third Year

Fall	Hours	Spring	Hours
CPE 271 & 271L	4	ECON 201 (GEF 4)	3
MAE 243	3	MAE 316	3
MAE 244L	1	MAE 342	3
MAE 320	3	MAE 353	3
MAE 331	3	MSEN 350	3
ROBE 313	3		
	17		15

Fourth Year

Fall	Hours	Spring	Hours
EE 251 & 251L	4	CPE 310 & 310L	4
CS 350	3	MAE 442*	3
IENG 302	2	MAE 456 & 456L	3

MAE 411 & 411L	3	ROBE 413*	3
ROBE 412*	3	ROBE 472S*	3
	15		16

Fifth Year

Fall	**Hours**
MAE 423	3
MAE 460	3
ROBE 414*	3
ROBE 471S*	3
Technical Elective	3
Technical Elective	3
	18

Total credit hours: 150

Major Learning Outcomes

MECHANICAL ENGINEERING

Upon graduation, all Bachelor of Science students in Mechanical Engineering will have acquired the:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The primary learning goal of the BSME program is to implement state-of-the-art instructional materials, methods and technologies in order to prepare engineers who are highly proficient in their field of specialty and ready to contribute to the well-being of society through competent practice of the engineering profession, leading to economic development and innovative technological advancements.

The graduates of the BSME program are well prepared to engage in the long-life pursuit of successful engineering careers by quickly adapting to the changing demands of the workforce in a dynamic global environment, by enhancing continuously their professional abilities or skills, and by contributing effectively in multidisciplinary teams to the advancement of existing or anticipated industrial, economical and societal needs.