MECHANICAL ENGINEERING, BS

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The mission of the mechanical engineering program at Syracuse University is to educate and promote learning and discovery in mechanical engineering and to prepare students for careers of technical excellence, professional growth, and leadership in a complex and competitive technological environment.

The educational objectives of the mechanical engineering curriculum are to enable graduates of the program to do the following:

- apply the physical, mathematical, and engineering sciences to professiona or to advanced study in mechanical engineering or related fields;
- be cognizant of societal context and ethical responsibility in their profession;
- function inclusively and productively on teams and communicate ideas to both technical and non-technical audiences; and
- be innovative and adaptable in a diverse and global environment

In order to meet the demands of new and existing high-tech industries, we prepare our students by providing opportunities to gain marketable and relevant skills that can lead to success in a wide range of careers. The distinctive signature of undergraduate mechanical engineering at Syracuse University is its strong technical core coupled with the ability to fit either a technical or a non-technical minor into the curricula. Students explore the breadth of Syracuse University by complementing their mechanical engineering degree with a minor in business, public policy, fine arts, public communications, and many more.

Mechanical engineering is a broad discipline concerned with the design and analysis of systems that produce or modify motion, force, and energy into forms useful to people. Mechanical engineers are employed throughout the complete spectrum of industries, including automotive, industrial machinery, publishing and printing, electrical and thermal power, chemical processing, textile, petroleum, computer and electronic, pharmaceutical, apparel, healthcare, consumer products, soap and cosmetics, paper and wood products, rubber, and glass.

Driven by the breadth of career paths open to mechanical engineering graduates, the B.S. program in mechanical engineering (MEE) is structured to provide a firm educational foundation in the physical, mathematical, and engineering principles and design practices relevant to mechanical and thermal systems. The program is designed to prepare graduates for either immediate employment or for continuing studies at the graduate level.

Requirements for the B.S. MEE program appear below. For the first five semesters the recommended sequence of courses for the B.S. MEE program is very similar to the recommended program for the degree B.S. in aerospace engineering (AEE), which demonstrates the complementary nature of the two disciplines. Courses carrying the prefix MAE indicate that class material and assignments are drawn from both aerospace and mechanical engineering applications.

Beginning in the sixth semester students who follow the B.S. MEE program begin to take courses addressing engineering topics unique to mechanical engineering, including machine design and manufacturing and heat transfer. The last three semesters of the MEE program also include courses of more broad applications, including dynamics of mechanical systems and linear control systems.

Experience with open-ended design problems is obtained in a sequence of courses that span the entire curriculum. The sequence begins with introductory design experiences in the first-year courses ECS 101 Introduction to Engineering and Computer Science.

Upper-division courses involving design include courses in machine design and manufacturing, and senior capstone design. The two-semester capstone design experience (MEE 471 Design Practice, MEE 472 Synthesis of Mechanical Systems) requires students to integrate knowledge from all areas in the design of a complete product or system.

The B.S. MEE curriculum allows for programs of study that can be tailored by students to take advantage of the diversity of strengths across both ECS and all of Syracuse University. We provide engineering students with opportunities to complete minors in areas that can complement technical knowledge-such as international affairs, business, and public policy-thus enhancing the value and attractiveness of a Syracuse University engineering education. Students elect to pursue a University minor or take a distribution of electives, which will include liberal arts classes, free electives, and additional depth in mechanical engineering. There are a total of 11 electives or selective elective courses (33 credits) in the B.S. MEE program. The University requires all students to take at least one course (3 credits) in the broad areas of Inclusion, Diversity, Equity, and Accessibility (IDEA). The list of approved I.D.E.A. courses can be found in the course catalog. One of the electives (3 credits) must be in economics; which must be either ECN 101 Introductory Microeconomics, ECN 102 Introductory Macroeconomics, or ECN 203 Economic Ideas and Issues. One of the electives (3 credits) must be in Social Sciences/Humanities (SS/H). One of the electives (3 credits) must be a MAE numerical elective; which must be either MAE 530 Introduction to Design Optimization, MAE 571 Applications of Computational Fluid Dynamics, or MAE 573 Application of Finite Element Analysis. One of the electives must be a MAE analysis elective; which must be either MAE 333 Data Analysis for Engineers or MAE 312 Engineering Analysis. The remaining 6 courses (18 credits) can be customized for each student in either of two ways:

1. A University Minor, typically 18 credits coordinated by the offering department. The minor must have fewer than 12 credits of overlap with required MEE courses. A second major also satisfies this option.
2. A Distribution of Electives, including:

a. at least 6 credits of SS/H
b. at least 9 credits of technical electives
c. one 3-credit free elective

MEE students seeking to complete a Mathematics Minor may take a mathematics course as a free elective but must still complete one of the 2 options listed above.

MEE students seeking to complete the Energy Systems Minor (15 credits) must take an additional 3-credit SS/H course.

Technical Electives are courses at the 300 level or higher taken within the Mechanical and Aerospace Engineering (MAE) Department. Selected courses from other ECS departments, mathematics, or natural sciences may be accepted as technical electives, but no more than 3 credit hours of technical electives can be taken outside the MAE department.

Students may bundle courses into free electives if desired. The bundled courses must be taken for a letter grade, and either be at the 300-level or greater, or be a physical education course. AEW credit cannot be bundled.

Social science or humanities (SS/H) courses are to be selected from any foreign language course, the "Humanities List", or the "Social Sciences List", as published in the SU Course Catalog.

To earn a Mechanical Engineering B.S. degree from Syracuse University, students must take 60% of the (26) Engineering and (45) Mechanical Engineering credits, which means that students must take at least 43 credits at Syracuse University. Engineering and Mechanical Engineering credits are courses with the following prefixes: ECS, ELE, MAE, MEE.

Students are strongly encouraged to develop a plan for selections of their electives during their first year. The planning process should include discussions with the student's academic advisor, other faculty members, and peer advisers. The MAE department offers most undergraduate technical elective courses on a two-year cycle. As a result, it may be necessary for a student to modify the sequence of courses recommended below to accommodate a technical elective course of personal interest.

In addition to successfully completing the requirements for the mechanical engineering program, graduates from this program must also achieve the student outcomes.

This program is accredited by Engineering Accreditation Commission of ABET, http://www.abet.org.

Student Learning Outcomes

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 the ethical and professional responsibilities in engineering situations and make informed judgements, 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 judgement to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies
8. An ability to apply advanced mathematics and advanced numerical methods to formulate, and to solve complex engineering problems

Mechanical Engineering Requirements

Year 1		
Fall		**Credits**
ECS 101	Introduction to Engineering and Computer Science	3
MAT 295	Calculus I	4
CHE 106	General Chemistry Lecture I	3
CHE 107	General Chemistry Laboratory I	1
WRT 105	Studio 1: Practices of Academic Writing	3
FYS 101	First Year Seminar	1
Select one of the following:		3
ECN 101	Introductory Microeconomics	
ECN 102	Introductory Macroeconomics	
ECN 203	Economic Ideas and Issues	
	Credits	**18**
Spring		
ECS 104	Engineering Computational Tools	3
MAT 296	Calculus II	4
PHY 211	General Physics I	3
PHY 221	General Physics Laboratory I	1
WRT 205	Studio 2: Critical Research and Writing	3
Elective #2 (I.D.E.A. Course)		3
	Credits	**17**
Year 2		
Fall		
ECS 326	Engineering Materials, Properties, and Processing	3
MAT 397	Calculus III	4
PHY 212	General Physics II	3
PHY 222	General Physics Laboratory II	1
ECS 221	Statics	3
Elective #3 (SS/H Course)		3
	Credits	**17**
Spring		
MAT 485	Differential Equations and Matrix Algebra for Engineers	3
ECS 222	Dynamics	3
ECS 325	Mechanics of Solids	3
MAE 251	Thermodynamics	3
MAE 284	Introduction to CAD	3
	Credits	**15**
Year 3		
Fall		
ELE 231	Electrical Engineering Fundamentals	3
ELE 291	Electrical Engineering Laboratory I	1
MAE 315	Mechanical and Aerospace Engineering Laboratory	3
MAE 341	Fluid Mechanics	4
MAE 312 or MAE 333	Engineering Analysis or Data Analysis for Engineers	3
Elective #5		3
	Credits	**17**
Spring		
MAE 321	Dynamics of Mechanical Systems	3

MAE 322	Control Systems for MAE	3
MAE 355	Fundamentals of Heat Transfer	4
MEE 332	Machine Design	4
Elective #6		3
	Credits	**17**
Year 4		
Fall		
MEE 416	Mechanical Engineering Laboratory	3
MEE 431	Manufacturing Processes	3
MEE 471	Design Practice	3
Elective 7: Select one of the following:		3
MAE 530	Introduction to Design Optimization	
MAE 571	Applications of Computational Fluid Dynamics	
MAE 573	Application of Finite Element Analysis	
Elective #8		3
	Credits	**15**
Spring		
MEE 472	Synthesis of Mechanical Systems	3
Elective #9		3
Elective #10		3
Elective #11		3
	Credits	**12**
	Total Credits	**128**

Other

GPA: 2.0 (All students must earn a minimum cumulative GPA of 2.00 and at least 2.00 GPA in all math, science and engineering courses in order to be awarded an SU degree.)

Note:
Do not repeat prerequisites for admission into the major.

Recommended Technical Electives

Code	Title	Credits
AEE 342	Aerodynamics	4
AEE 343	Compressible Flow	3
AEE 427	Aircraft Performance and Dynamics	4
AEE 446	Air-breathing and Rocket Propulsion	3
AEE 577	Introduction to Space Flight	3
ECS 511	Sustainable Manufacturing	3
ECS 526	Statistics for Engineers	3
MAE 457	Automotive Engineering for ECS Students	3
MAE 486	Fuel Cell Science and Technology	3
MAE 536	Composite Materials	3
MAE 548	Engineering Economics and Technology Valuation	3
MAE 551	Energy Conversion	3
MAE 553	HVAC Systems Analysis and Design	3
MAE 554	Principles of Refrigeration	3
MAE 571	Applications of Computational Fluid Dynamics	3
MAE 573	Application of Finite Element Analysis	3
MAE 585	Principles of Turbomachines	3
MAE 587	Design of Solar Energy System	3
MAE 588	Principles of Wind Turbines	3
MEE 571	Computer Aided Design	3
MFE 326	Probability and Statistical Methods for Engineers	4
NUC 301	Introduction to Nuclear Engineering and Reactor Safety	3
NUC 510	Nuclear Reactor Design, Operation and Safety	3