

# MECHANICAL ENGINEERING, B.S.E.

The Bachelor of Science program in Mechanical Engineering is designed to prepare students for immediate entry into the mechanical engineering profession or graduate study toward advanced degrees. The program provides a breadth of topics covered by integrated lecture and laboratory instruction with a strong emphasis on hands-on learning, culminating in a year-long, team-based capstone design project. Students have the option to pursue the following technical concentrations for more focused exploration and advanced career preparation:

- Aerospace Engineering
- Biomedical Engineering
- Robotics and Mechatronics
- Design and Innovation
- General Mechanical Engineering

## Program Educational Objectives

The Mechanical Engineering undergraduate program has established the following program educational objectives that are consistent with the University's mission and the program's student outcomes. During the first 3-5 years after graduation, mechanical engineering students will:

1. Demonstrate competency and leadership in professional engineering activities.
2. Advance in their professional careers and pursue continuous learning in areas relevant to their long-term goals.
3. Contribute productively to cross-functional teams, communicate effectively, and demonstrate professional and ethical responsibility.

Graduates are prepared to accomplish these program educational objectives a few years after graduation through the major requirements, the core curriculum, design competition experiences, internships, research opportunities, professional society involvement, and extracurricular activities.

## Accreditation

The Mechanical Engineering undergraduate program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Mechanical Engineering and Similarly Named Engineering Programs.

## Transfer Requirements

Students who are currently enrolled in another major at LMU but are interested in changing their major to MECH must complete CHEM 111 General Chemistry I Lab, CHEM 114 General Chemistry for Engineers; ENGR 2001 Statics; MATH 131 Calculus I, MATH 132 Calculus II; and PHYS 1100 Introduction to Mechanics with a minimum grade of C (2.0) in each course before being considered. Final approval of the transfer request resides with the Chair of the Mechanical Engineering Department.

## Student Outcomes

The mechanical engineering undergraduate program has established the following student outcomes that support the program educational

objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering.

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

## Graduation Requirements for the Mechanical Engineering B.S.E.

Program criteria for graduation include:

1. completion of a minimum of 30 semester hours of mathematics and basic sciences and a minimum of 45 semester hours of engineering topics,
2. a minimum grade point average of C (2.0) in all lower division major courses (excluding University core), and
3. all upper division MECH courses must be completed in residence.

## Major Requirements

Code	Title	Semester Hours
Electrical Engineering		
EECE 2220	Instrumentation and Measurement	4
General Engineering		
ENGR 100	Introduction to Engineering	
ENGR 190	Engineering Seminar	
ENGR 1200	Computational Engineering	
ENGR 1300	Engineering Visualization	
ENGR 2001	Statics	
Mechanical Engineering		
MECH 2100	Design and Manufacturing	
MECH 2200	Mechanical Engineering Lab I	
MECH 2210	Materials Science	
MECH 2230	Thermodynamics	
MECH 3100	Mechanical Engineering Lab II	
MECH 3110	Mechanics of Materials	
MECH 3120	Dynamics and Control I	
MECH 3130	Fluid Mechanics	
MECH 3200	Mechanical Engineering Lab III	

MECH 3210	Machine Design
MECH 3220	Dynamics and Control II
MECH 3230	Heat Transfer
MECH 4100	Capstone Design I
MECH 4190	Professional Practice
MECH 4200	Capstone Design II

## Mathematics and Basic Sciences

CHEM 111	General Chemistry I Lab
CHEM 114	General Chemistry for Engineers
MATH 131	Calculus I
MATH 132	Calculus II
MATH 234	Calculus III
MATH 246	Differential Equations and Linear Algebra
PHYS 1100	Introduction to Mechanics
PHYS 2100	Introduction to Electricity and Magnetism
One math/science elective course <sup>1</sup>	

Technical Concentration: options and requirements are described in the following section

University Core: A minimum of 30 semester hours as defined in the core curriculum for students in the Frank R. Seaver College of Science and Engineering

<sup>1</sup>

The math/science elective options include:

- A 200-level (or higher) MATH course with a prerequisite of MATH 131 or higher
- A 200-level (or higher) BIOL or CHEM course with a prerequisite of CHEM 112 or higher
- PHYS 2600, PHYS 371, or PHYS 4300

## Technical Concentrations

The default concentration for all students is General Mechanical Engineering. If interested, students should talk with their advisor and declare one of the other following technical concentrations prior to registration for the spring semester of their junior year. Students must complete the technical elective requirements listed below for their declared concentration.

### Aerospace Engineering

Code	Title	Semester Hours
Select two of the following:		
MECH 520	Computational Fluid Dynamics	
MECH 541	Compressible Flow	
MECH 542	Turbomachinery	
MECH 544	Propulsion	
MECH 546	Aerodynamics	
Select one of the following:		
MECH 509	Failure Analysis	
MECH 510	Computer-Aided Manufacturing	
MECH 511	Materials Selection in Design	
MECH 515	Composites	
MECH 517	Fracture Mechanics	
MECH 518	Design for Manufacturing	
MECH 519	Advanced Vibrations	

MECH 528	Advanced Dynamics
MECH 529	Advanced Control Systems
MECH 533	Additive Manufacturing
MECH 534	Metallurgical and Materials Engineering
MECH 539	Design for Additive Manufactur
PHYS 4100	Space Physics
SYEG 570	Spacecraft Design
One additional 500-level MECH course	

### Biomedical Engineering

Code	Title	Semester Hours
Select one of the following:		
MATH 205	Applied Statistics	
MATH 360		
MATH 361	Probability and Mathematical Statistics	
HHSC 155	and	0
and HHSC 156		
HHSC 480	and	0
and HHSC 481		
Select one of the following:		
HSEG 505		
HSEG 506		
HSEG 507		
MECH 545	Fundamentals of Biomedical Engineering	
PHYS 4300	Biophysics	
One additional 500-level MECH course		

### Design and Innovation

Code	Title	Semester Hours
Select one of the following:		
MECH 510	Computer-Aided Manufacturing	
MECH 518	Design for Manufacturing	
MECH 539	Design for Additive Manufactur	
Select one of the following:		
MECH 509	Failure Analysis	
MECH 511	Materials Selection in Design	
MECH 515	Composites	
MECH 517	Fracture Mechanics	
MECH 519	Advanced Vibrations	
MECH 533	Additive Manufacturing	
MECH 534	Metallurgical and Materials Engineering	
MECH 545	Fundamentals of Biomedical Engineering	
One additional course from the above two lists OR one from the following		
PHYS 3300	Thermodynamics and Statistical Mechanics	
SYEG 510	Project Management	
SYEG 570	Spacecraft Design	
One additional 500-level MECH course		

## Robotics and Mechatronics

Code	Title	Semester Hours
MATH 251	Applied Linear Algebra	4
EECE 2240	Introduction to Digital Systems	4
EECE 3140	Microprocessor and Microcontroller Systems	4
Select one of the following:		
CMSI 2120	Data Structures and Applications	
CMSI 3630	Data Structures and Algorithms in Engineering	
MECH 529	Advanced Control Systems	
MECH 531		
MECH 532	Robotics	
One additional 500-level MECH course		

## General Mechanical Engineering

Code	Title	Semester Hours
One upper division course from any of the other technical concentration lists or required by any technical concentration or CMSI 2120		
Three additional 500-level MECH courses		

## Mechanical Engineering Curriculum

Course	Title	Semester Hours
<b>First Year</b>		
<b>Fall</b>		
CHEM 111	General Chemistry I Lab	1
CHEM 114	General Chemistry for Engineers	3
ENGR 100	Introduction to Engineering	3
ENGR 190	Engineering Seminar	1
MATH 131	Calculus I	4
FFYS 1000	First Year Seminar	3-4
ORNT 1000	First Year Forum	0
<b>Semester Hours</b>		<b>15-16</b>
<b>Spring</b>		
ENGR 1200	Computational Engineering	2
ENGR 1300	Engineering Visualization	2
MATH 132	Calculus II	4
PHYS 1100	Introduction to Mechanics	4
RHET 1000	Rhetorical Arts	3-4
<b>Semester Hours</b>		<b>15-16</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
ENGR 2001	Statics	2
MATH 234	Calculus III	4
MECH 2100	Design and Manufacturing	3
PHYS 2100	Introduction to Electricity and Magnetism	4
University Core		4
<b>Semester Hours</b>		<b>17</b>
<b>Spring</b>		
EECE 2220	Instrumentation and Measurement	4
MATH 246	Differential Equations and Linear Algebra	4
MECH 2200	Mechanical Engineering Lab I	0
MECH 2210	Materials Science	4
MECH 2230	Thermodynamics	4
<b>Semester Hours</b>		<b>16</b>

### Junior Year

<b>Fall</b>		
MECH 3100	Mechanical Engineering Lab II	0
MECH 3110	Mechanics of Materials	4
MECH 3120	Dynamics and Control I	4
MECH 3130	Fluid Mechanics	4
University Core		4
<b>Semester Hours</b>		<b>16</b>
<b>Spring</b>		
MECH 3200	Mechanical Engineering Lab III	0
MECH 3210	Machine Design	4
MECH 3220	Dynamics and Control II	4
MECH 3230	Heat Transfer	4
University Core		4
<b>Semester Hours</b>		<b>16</b>

### Senior Year

<b>Fall</b>		
MECH 4100	Capstone Design I	3
MECH 4190	Professional Practice	1
Technical Concentration Elective		3
Technical Concentration Elective		3-4
Math/Science Elective		2-4
University Core		4
<b>Semester Hours</b>		<b>16-19</b>
<b>Spring</b>		
MECH 4200	Capstone Design II	3
Technical Concentration Elective		3
Technical Concentration Elective		3-4
University Core		4
University Core		4
<b>Semester Hours</b>		<b>17-18</b>
<b>Minimum Semester Hours</b>		<b>128-134</b>