Department of Mechanical Engineering

Brigham Young University-Idaho 2007-2008

The Mechanical Engineering Department has two engineering programs from which to select a career path. These are:

1. 4-Year Bachelor of Science in Mechanical Engineering, BSME (470)
2. 2-Year Associate of Applied Science in Engineering (351)

These programs are available to students entering Brigham Young University—Idaho on any admission track. These engineering programs are designed to provide students with the competencies necessary to work in a variety of exciting fields within engineering. These majors offer excellent placement potential, professional job satisfaction, and substantial salaries. Students entering either of these two programs can expect a well-designed and rigorous curriculum based on industry standards. The 2-year associate program also allows students to continue their engineering education at a 4-year university in engineering fields other than mechanical engineering. Areas of emphasis available in the associate program include chemical, civil, electrical and mechanical engineering.

Program Objectives

To achieve the program educational objectives, the following outcomes will be measured during the course of study within the program.

1. Demonstrate and maintain faith in God, and exhibit high standards of personal integrity and professional ethics through lifelong service to family, church, profession, and community. [Service]
2. Demonstrate and maintain faith in God, and exhibit high standards of personal integrity and professional ethics through lifelong service to family, church, profession, and community. [Leadership]
3. Apply fundamental principles of design and analysis to develop innovative solutions in an industrial and societal context. [Design]
4. Maintain currency in their field through continued learning and education. [Lifelong Learning]

Program Educational Objectives

The program objectives for the baccalaureate degree are to produce engineering graduates who:

1. Demonstrate and maintain faith in God, and exhibit high standards of personal integrity and professional ethics through lifelong service to family, church, profession, and community. [Service]
2. Provide leadership in their chosen field of endeavor through the application of effective interpersonal, communication, and teamwork skills. [Leadership]
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Program Outcomes

To achieve the program educational objectives, the following outcomes will be measured during the course of study within the program.

1. Demonstrate their knowledge and application of engineering fundamentals, systems, and the laws of physics and natural science to engineering analysis and design problems.

Program Specifications

Advising

It is imperative that students develop and follow a plan of study that will allow them to complete all the required courses within the credit hour limits. Due to the credit hour limit, no minor programs are available within the Mechanical Engineering program. Students in the BSME program are encouraged to take the Fundamentals of Engineering (FE) exam before they graduate. This is an important milestone of achievement for each ME engineering student in preparing him/her for future licensing as a Professional Engineer (PE).

Using techniques, skills, and modern engineering modeling tools, students must demonstrate their abilities to apply mathematics, engineering science, and technology principles necessary for analyzing, modeling, and solving engineering problems. Students must communicate effectively in written and oral presentation. Each student must gain an understanding of professional and ethical behavior in the workplace. Finally, students should understand that learning is a life-long process and develop a desire to continue to enhance their abilities as a professional engineer.

Mathematics and physical sciences are critical components of any engineering curriculum. The normal entry level mathematics class for engineering is Calculus I (Math 112). Entering freshman students should consult with their advisor to ensure they are beginning with the mathematics course for which they are prepared. Students with weak mathematics skills are advised to enroll in a preparatory mathematics course to strengthen their skills. For engineering students the normal entry level chemistry course is General Chemistry (Chem 105). These engineering programs are specialized degrees at Brigham Young University—Idaho. The BSME degree is designed for completion in the 120 credit hours, and the AASE degree in 63-69 credit hours. It is imperative that students develop and follow a plan of study that will allow them to complete all the required courses within these credit hour limits. Due to the credit hour limit, no minor programs are available within the Mechanical Engineering program. Courses in the ME curriculum have prerequisite courses that must be taken. Specific general education courses are required for the engineering majors. Each student must consult with his/her advisor early to make sure his/her educational plan is correct. The Advising Center and each faculty advisor have a sample curriculum flow chart that can be used as an example plan.

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2. Demonstrate their ability to analyze and interpret the behavior of a physical system through experimentation.

3. Use acquired math skills (calculus, linear algebra, ordinary differential equations, and statistical analysis) in solving engineering design and analysis problems.

4. Use modern engineering computer software and hardware tools to create models of physical systems in order to predict behavior and develop solutions to engineering problems.

5. Competently present their technical findings to peers, supervisors, and the faculty in both oral and written format.

6. Exhibit and maintain high ethical, moral and professional standards expected of members of the Church of Jesus Christ of Latter-Day Saints, and as graduates from Brigham Young University-Idaho.

7. Design, model, and manufacture components, systems, or processes necessary to meet product specifications for a competitive market environment.

8. Demonstrate an understanding of modern manufacturing procedures and project management techniques as applied to the development, manufacture, and delivery of customer products.

9. Learn to function as a contributing team member in a multi-discipline work environment.

10. Develop an understanding of the impact engineering design has on the world.

11. Continue their educational processes beyond baccalaureate degree in graduate studies and/or enhancement of skills within the work environment.
IV. Related Skills:

Religion Requirement:
Take these courses:
- ENG 111 3
- MATH 112 4
- AMHER 170 3
- ENG 316 3
- REL 121 2
- ENG 111C 3
- ENG 316C 3
- REL 122 2

OR
Take this course:
- REL 221 4

AND
Take 3 credits:
- REL 100 2
- REL 130 2
- REL 211 3
- REL 234 2
- REL 261 2
- REL 264 2
- REL 301 3
- REL 301H 3
- REL 302 3
- REL 302H 3
- REL 324 3
- REL 333 2
- REL 341 2
- REL 342 3
- REL 351 2
- REL 352 2
- REL 370 2
- REL 431 2
- REL 471 3
- REL 475 2

Take these courses:
- Chem 105 4
- Math 113 3
- Math 214 3
- Math 371 3

Take these courses:
- Ph 220 3
- Chem 106 4
- Const 340 3
- CS 124 3
- CS 144 3
- Chem 351 4
- CS 144 3
- CS 165 3
- ME 131 3
- Chem 352 4
- ME 172 3
- ME 201 3
- CS 234 2
- CS 234 2
- Chem 352 4
- ME 201 3
- ME 250 3
- ME 250 3
- Ph 123 3
- Ph 123 3

Take 1 Course:
- ME 132A 3
- ME 132B 3

Take 1 Course:
- ME 132A 3
- ME 132B 3

Select One Option

Choose any 200 level or higher course with Math, ME, Chem, CS, or Ph prefix

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Choose any 200 level or higher course with Math, ME, Chem, CS, or Ph prefix

Choose any 200 level or higher course with Math, ME, Chem, CS, or Ph prefix

Fall—Winter— YES
Winter—Summer— NO
Summer—Fall— NO

No Double Counting of Major Courses - No Grade Less Than C- in Major Courses
### BS in Mechanical Engineering

#### General Education Requirements

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<th>Category</th>
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**Total GE Credits:** 43

#### Major Requirements

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**Total Major Credits:** 73
ME 105 Essentials of Welding (4:2:4)
A course in joining processes that includes welding, standard fasteners (nuts, bolts), non-standard fasteners (inserts, blind fasteners), adhesive, foam tapes and epoxies and other processes.

ME 131 Manufacturing Processes I (3:2:2)
Prerequisite: Math 101
Integration of manufacturing processes. Emphasis on principles of mechanical mass reducing and surface finishing processes, machining parameters, measurement, and material selection.

ME 132 Manufacturing Processes II - CNC Lab Emphasis (2:2:2)
Prerequisite: ME 131, ME 172
Integration of manufacturing and engineering design. Introduction to the engineering design process through the development of industry related engineering projects. In-depth instruction on manufacturing processes with major focus on CNC and CAM.

ME 135 Dynamic Systems and Instrumentation (3:3:2)
Prerequisite: Math 316 or Math 371, ME 204, PH 220
First and second law analysis of open and closed systems. Energy and entropy concepts in power and refrigeration cycles.

ME 202 Strength of Materials (3:3:0)
Prerequisite: ME 201
Review of equations of static equilibrium, introduction to engineering stress and strain; thermal loading, stress distributions resulting from axial, torsional, and transverse (beam) loadings, combined loading problems, stress and strain transformation, Mohr’s circle, deflection of axial members, torsional members, and beams including statically indeterminate structures, column buckling.

ME 204 Numerical Methods (3:3:2)
Prerequisite: CS 144
Introduces the use of numerical methods for solving engineering problems. Covers several specific techniques such as finding roots of an equation, solving linear algebraic systems, fitting data points to a curve, performing numerical integration, and solving ordinary differential equations. Numerical techniques are implemented using MATLAB.

ME 250 Materials Science (3:3:0)
Prerequisite: Chemistry 105; Mathematics 112
Atomic and microstructure of engineering materials, including metals, ceramics, polymers, and composites. Factors influencing the fabrication, processing, and selection of materials in engineering design and analysis. Concepts of forces, moments and other vector quantities; free body diagrams, particle and rigid body statics, trusses, frames and machines; friction, centroids and moments of inertia. Vector analysis used.

ME 205 Engineering Mechanics: Statics (2:2:2)
Prerequisite: Math 112
Concepts of forces, moments and other vector quantities, free body diagrams, particle and rigid body statics, trusses, frames and machines; friction, centroids and moments of inertia. Vector analysis used.

ME 206 Engineering Mechanics: Statics (2:2:2)
Prerequisite: Math 112
Concepts of forces, moments and other vector quantities, free body diagrams, particle and rigid body statics, trusses, frames and machines; friction, centroids and moments of inertia. Vector analysis used.

ME 207 Introduction to Statics (3:3:2)
Prerequisite: Math 215
Introduction to statistical methods for assessing quality in engineered products. Review of basic statistical concepts of central tendency and dispersion of data. Introduces statistical process control, design of experiments, statistical tolerance analysis, and concepts of six sigma quality.
ME 337 Kinematics (3:3:0)
Prerequisite: Math 204
Relative motion of links in mechanisms, velocities and accelerations of machine parts, rolling contact, cams, synthesis of mechanisms. Includes computer-aided engineering techniques.
(As Necessary)

ME 350 Fluid Mechanics (3:3:2)
Prerequisite: Math 316 or Math 371, ME 204, PH 122
Introduction to fluid mechanics and incompressible fluid flow, fluid statics, fluid dynamics, control volume and differential analysis of fluid flow, dimensional analysis and scale models, internal and external viscous flows, turbomachinery. Flow measurement lab included.
(Fall, Winter, Summer)

ME 370 Mechanical Systems Design (3:3:2)
Prerequisite: ME 172, ME 202, ME 204, ME 250
Analysis, modeling and design of mechanical components and systems, materials, processes and structural analysis, static and dynamic failure theories; analysis and design of machine elements. Use of computer-aided design tools emphasized.
(As Needed)

ME 394 Internship (1-3:0:0)
Prerequisite: ME 322
Industrial work experience.
(As Needed)

ME 409 Thermodynamics II (3:3:2)
Prerequisite: ME 360
Comprehensive one-semester integrated design experience using the engineering design process and skills gained in engineering science classes. Product conception, development, design, and manufacturing.
(As Needed)

ME 428 Capstone Project I (2:2:2)
Prerequisite: Senior standing, ME 480
Second semester of an integrated design experience using the engineering design process and skills gained in engineering science classes. Product conception, development, design, and manufacture.
(As Needed)

ME 495 Special Topics in Mechanical Engineering (1-3:1:3-3:0)
Prerequisite: Consent of Instructor
A one-semester course emphasizing current topics in engineering.
(As Needed)

ME 438 CAE Modeling and Digital Simulation (3:3:3)
Prerequisite: Math 204
A study of advanced Computer-Aided Design and engineering applications in design, modeling, simulation and customization. The use of CAD and engineering software tools is stressed.
(As Necessary)

ME 446 Thermodynamics of Composite Materials (3:3:3)
Prerequisite: Math 320, ME 204, ME 250
An introduction to laminated composite materials and structures. An investigation of the micro-mechanical and macro-mechanical behavior of anisotropic plies. Development of classical lamination theory for predicting the mechanical behavior of laminated composite plates. Laboratory work involving fabrication and testing of composite laminates.
(As Needed)

ME 449 Fundamentals of Finite Element Analysis (2:2:2)
Prerequisite: Math 316, ME 202, ME 242
This course provides an introduction to the finite element method. Characteristics of continuous and discrete basic finite elements are evaluated. The finite element method is applied to both structural and thermal problems. Applications of the finite element method are carried out the commercial software.
(As Needed)

ME 470 Mechatronics (3:3:2)
Prerequisite: ME 315
This course provides an introduction to systems that contain both electrical and mechanical elements. Methods for modeling and controlling the behavior of such systems are discussed. Several computer-based methods and tools are presented, including the use of programmable logic controllers and data acquisition software.
(As Needed)

ME 480 Capstone Project I (2:2:2)
Prerequisite: Senior standing, ME 370, ME 380
Comprehensive one-semester integrated design experience using the engineering design process and skills gained in engineering science classes. Product conception, development, design, and manufacture. Applications of the finite element method are carried out the commercial software.
(As Needed)

ME 496 Special Topics in Mechanical Engineering (1-3:1:3-3:0)
Prerequisite: Consent of Instructor
A one-semester course emphasizing current topics in engineering.
(As Needed)