Department of

Mechanical Engineering

Garth Miller, Department Chair

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http://www.byui.edu/MechEngr /

Department of Mechanical Engineering

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

4-Year Bachelor of Science in Mechanical Engineering, BSME (470)

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 baccalaureate degree program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). 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.

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.

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 (FDMAT 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 60-62 credits 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 hours limit, no minor programs are available within the Mechanical Engineering program. Courses in the ME curriculum have prerequisite courses that must be taken. 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.

Program Educational Objectives

The program objectives for the baccalaureate degree in mechanical engineering 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]

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 Outcomes

To achieve the program educational objectives, the following outcomes will be measured during the course of study within the program. Assesment methods consistent with accreditation recommendations will be used to determine how each student meets these outcomes. Students will:

1. Demonstrate their knowledge and application of engineering mechanical systems, thermal systems, and the laws of physical and natural science to engineering analysis and design problems.

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.

AAS in Engineering (351)

Take required Foundations courses

Major Requirements

No Double Counting of Major Courses - Students must maintain a minimum grade of C- in their major courses

Take these courses:

CHEM 105	4
MATH 113	3
MATH 214	3
MATH 371	3
PH 220	3
	16

Take 1 course:

MATH 321	3
MATH 341	3
	3

Select One Option

Chemical Engineering Option

Take these courses:

CHEM 106	4
CHEM 351	4
CHEM 352	4
ME 142	2
ME 242	3
PH 121	3
*Technical Elective	3
Elective	2
	25

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

Civil Engineering Option

Take these courses:

CONST 340	3
ME 142	2
ME 172	3
ME 201	2
ME 202	3
ME 204	3
ME 218	1
ME 242	3
ME 250	3
PH 123	3
	26

Electrical Engineering Option

Take these courses:

CS 124	3
CS 165	3
CS 235	3
CS 237	3
COMPE 150	3
COMPE 224	3
COMPE 250	4
PH 121	3
Elective	1
	26

Mechanical Engineering Option

Take these courses:

ME 131	2
ME 142	2
ME 172	3
ME 201	2
ME 202	3
ME 204	3
ME 218	1
ME 242	3
ME 250	3
PH 123	3
	25

Take 1 course:

ME 132A	2
ME 132B	2
	2

Total Major Credits=44

This major is available on the following tracks:

Fall-Winter---- YES Winter-Spring---- YES Spring-Fall---- YES

BS in Mechanical Engineering (470)

Take required Foundations courses

Major Requirements

No Double Counting of Major Courses - Students must maintain a minimum grade of C- in their major courses

Take these courses:

CHEM 105	4
COMPE 305	3
MATH 215	4
MATH 316	4
ME 131	2
ME 142	2
ME 172	3
ME 201	2
ME 202	3
ME 204	3
ME 218	1
ME 242	3
Cont. next column	

Cont. from previous column

ME 250	3
ME 280	3
ME 315	3
ME 322	4
ME 330	3
M3 360	3
ME 370	3
ME 380	3
ME 423	3
ME 480	3
PH 123	3
PH 220	3
	71

Take 7 credits:

COMPE 470	3
ME 337	3
ME 398	1-3
ME 422	3
ME 425	3
ME 438	3
ME 445	3
ME 460	3
ME 470	3
ME 482	3
ME 490	1-3
ME 495R	1-3
	7

Take 1 course:

ME 132A	2
ME 132B	2
	2

Program Notes:

Total Major Credits=80

This major is available on the following tracks:

Fall-Winter---- YES Winter-Spring---- YES Spring-Fall---- YES

Mechanical Engineering Pre-approved Cluster

Engineering Cluster		
Take this course:		
ME 172	Visualization in Engineering Design	3
Take 4 credits:		
ME 105	Essentials of Welding	4
ME 131	Manufacturing Processes I	2
ME 132A*	Manufacturing Processes II	2
ME 132B*	Manufacturing Processes II	2
*Only 1 of these 2 classes may be taken for credit		
Take 8 credits:		
FDMAT 112	Calculus I	4
ME 142	Engineering Computation I	2
ME 201	Engineering Mechanics: Statics	2
ME 202	Strength of Materials	3
ME 204	Engineering Mechanics: Dynamics	3
ME 218	Materials Lab	1
ME 242	Engineering Computation II	3
ME 250	Materials Science	3
	Total Credits	**15**

Course Descriptions — Credits*

ME 105 Essentials of Welding (4:2:4)
Fee: $30.00
A course in joining processes that includes welding, standard fasteners (nuts,bolts), non-standard fasteners (inserts, blind fasteners), adhesives, foam tapes and epoxies and other processes.
(Fall, Winter)

ME 115 Computerized Technical Illustration (2:2:0)
This course will explore the basic system of technical illustration, the use of construction aids and grids, and special techniques in rendering an animation. Students will be introduced to 3D Solids modeling and rendering using the computer software (3D Studio VIZ R3) and animation techniques. This course is designed heavily around the use of 3D drawings. Students will learn to accurately portray any given object three dimensionally (both manually and using the computer).
(Fall, Spring)

ME 131 Manufacturing Processes I (2:2:1)
Integration of manufacturing processes. Emphasis on principles of mechanical mass reducing and surface finishing processes, machining parameters, measurement, and material selection.
(Fall, Winter, Spring)

ME 132A Manufacturing Processes II - CNC Lab Emphasis (2:2:1)
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 processes.
(Fall, Winter, Spring)

ME 132B Manufacturing Processess II - Joining Processes Lab Emphasis (2:2:1)
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 Joining Processes.
(Fall, Winter, Spring)

ME 142 Engineering Computation I (2:2:0)
Prerequisite: FDMAT 112
This course provides an introduction to computation in the context of engineering problem solving. Fundamental principles of computation, such as computer representation of numbers and round-off error, are presented. Basic numerical methods, including numerical integration, differentiation, and root finding, are covered. An introduction to computer programming, including flowcharts, loops, condition statements, and functions, is given. Emphasis is placed on using MS Excel to solve computational problems, and using VBA within Excel to create computer programs. A brief introduction to commerical math software packages is also given.
(Fall, Winter, Spring)

ME 172 Visualization in Engineering Design (3:3:0)
Fundamentals of 3D parametric modeling and engineering design concepts including: orthographic projection, auxiliary views, sectioning, dimensions, working drawings, assembly modeling, parametric modeling fundamentals, and standards (ANSI and ISO). Instruction in computer-aided design tools with application to Mechanical Engineering.
(Fall, Winter, Spring)

ME 201 Engineering Mechanics: Statics (2:2:0)
Prerequisite: FDMAT 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.
(Fall, Winter, Spring)

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.
(Fall, Winter, Spring)

ME 204 Engineering Mechanics: Dynamics (3:3:0)
Prerequisite: ME 201
The study and application of the concepts of dynamics to particles, systems of particles, and rigid bodies. Scalar and vector analysis used.
(Fall, Winter, Spring)

ME 218 Materials Lab (1:0:2)
Prerequisite: ME 202
Laboratory investigations in materials science and strength of materials.
(Fall, Winter, Spring)

ME 242 Engineering Computation II (3:3:0)
Prerequisite: ME 142, ME 202, ME 204, Math 316 or Math 371
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.
(Fall, Winter, Spring)

ME 250 Materials Science (3:3:0)
Prerequisite: Chem 105; FDMAT 112
Atomic and microstructure of engineering materials, including metals, ceramics, polymers, and composites. Factors influencing the farication, processing, and selection of materials in engineering analysis and design. Case studies of engineering material failures. Use of material selection software.
(Fall, Winter, Spring)

ME 280 ME Design I: Practical Mechanical Design (3:2:2)
Prerequisite: ME 132A or ME 132B, ME 202
This course focuses on the practical aspects of mechanical design and teaches concepts such as the integration of engineering analysis and design, the strategic use of CAD in making design decisions, the effective use of vendor off-the-shelf mechanical components, and manufacturing process considerations in design. The concepts are taught in the context of small design projects where students design and build mechanical devices throughout the semester.
(Fall, Winter, Spring)

ME 315 Dynamic Systems and Instrumentation (3:3:2)
Prerequisite: Math 316 or Math 371, ME 204, ME 242, PH 220
This course provides an introduction to dynamic system modeling and analysis. Basic instrumentation and data acquisition techniques are also presented. Major topics covered in this course include lumped parameter models of dynamic systems, derivation of state equations, analytical and numerical solution of state equations, frequency response analysis, instrumentation, and data acquisition. Professional software is used in obtaining numerical solutions of state equations and in performing data acquistion.
(Fall, Winter, Spring)

ME 322 Thermodynamics I (4:4:1)
Prerequisite: ME 204
Fundamentals of classical thermodynamics. Thermodynamic property relationships for ideal gasses, vapors, liquids and solids. First and second law analysis of open and closed systems. Energy and entropy concepts in power and refrigeration cycles. Laboratory experiences with thermodynamic devices.
(Fall, Winter, Spring)

ME 330 Engineering Statistics (3:3:0)
Prerequisite: Math 214 or Math 215
Introduction to statistical methods for assuring 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.
(Fall, Winter, Spring)

ME 337 Kinematics (3:3:0)
Prerequisite: ME 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)

* Credit Description (Credit Hours : Lecture Hours per week : Lab Hours per week)

ME 360 Fluid Mechanics (3:3:2)
Prerequisite: Math 316 or Math 371, ME 204, ME 242, Ph 123
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 flow, turbomachinery. Flow measurement lab included.
(Fall, Winter, Spring)

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 sytems, materials, processes and structural analysis, static and dynamic failure theories; analysis and design of machine elements. Use of computer-aided design tools emphasized.
(Fall, Winter, Spring)

ME 380 ME Design II: Product Design (3:2:2)
Prerequisite: ME 132A or ME 132B, ME 242, ME 330
This course introduces a structured design methodology for product development. The methodology includes such topics as product specification, concept generation, concept selection, and prototying. Other topics that are associated with the design process, such as economic analysis and intellectual property, are also presented.
(Fall, Winter, Spring)

ME 398 Internship (1-3:0:0)
Prerequisite: Consent of instructor.
Industrial work experience.
(Fall, Winter, Spring)

ME 422 Thermodynamics II (3:3:1)
Prerequisite: ME 322
Application of principles of thermodynamics to air standard cycles (Otto, Diesel, Brayton, Sterling, and Ericsson), steam power cycles (Rankine), and refrigeration and heat pump cycles. Property calculations for gas mixtures. Processes involving air water mixtures, psychrometric charts, etc., with applications to air-conditioning and drying processes. Introduction to Thermodynamic calculations for combustion chemical reactions. Laboratory experience analyzing thermodynamic systems.
(As needed)

ME 423 Heat Transfer (3:3:2)
Prerequisite: ME 322, ME 360
Fundamentals of conduction, convection, and radiant modes of heat transfer; fundamental equations for steady and unsteady conduction; heat exchanger analysis and design; design of systems involving multi-mode heat transfer.
(Fall, Winter, Spring)

ME 425 Fluid Mechanics II (3:3:2)
Prerequisite: ME 360, ME 322
This course is a follow-on course to the introductory fluid mechanics course. Some topics including integral momentum, modeling and similitude, and analysis of piping systems from the introductory course will be explored in greater depth and detail. New topics covered may include potential flow, compressible flow, computational fluid dynamics, and turbulence. This course will analyze more involved fluid systems.
(As needed)

ME 438 CAE Modeling and Digital Simulation (3:3:0)
Prerequisite: Senior standing or consent of Instructor.
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. Topics include engineering design process, project management, advanced solids modeling techniques, kinematic analysis, digital simulation techniques, and customization techniques.
(As needed)

ME 445 Mechanics of Composite Materials (3:3:0)
Prerequisite: ME 202, ME 242, ME 250
An introduction to laminated composite materials and structures. An investigation of the micromechanical and macromechanical 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 460 Fundamentals of Finite Element Analysis (3:3:0)
Prerequisite: Math 316, ME 172, ME 202, ME 242
This course provides an introduction to the finite element method. Characteristics and limitations of several 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 with commercial software.
(As needed)

ME 470 Mechatronics (3:3:0)
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 ME Design III: Capstone Design (3:2:2)
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.
(Fall, Winter, Spring)

ME 482 Capstone Project II (3:2:2)
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 490 Special Problems in Mechanical Engineering (1-3:1:0)
Prerequisite: Consent of Instructor.
Students complete individual major projects or research in engineering, under the supervision of a faculty member.
(Fall, Winter, Spring)

ME 491 Fundamentals of Engineering Exam Preparation (1:0:2)
Prerequisite: Senior standing
Course designed to prepare students to take and pass the Fundamentals of Engineering Exam.
(As needed)

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

ME 498 Internship (1-3:0:0)
Prerequisite: Consent of Department Chair, Senior standing
Industrial work experience.
(Fall, Winter, Spring)

* Credit Description (Credit Hours : Lecture Hours per week : Lab Hours per week)