Department of Mechanical Engineering

General Information

Idaho State University mechanical engineering graduates are successfully employed in many areas and many have chosen to continue advanced studies in a wide variety of specialized engineering disciplines throughout the region and nation.

Every student entering the mechanical engineering program is assigned a faculty advisor to guarantee an appropriate plan of study and to ensure continuity throughout the program. Each student completes university general education courses and mechanical engineering program requirements. A student who pursues a double major should regularly consult with a faculty member from each of the two major programs.

Students entering the mechanical engineering program should have adequate credentials in algebra and trigonometry or higher to enter the calculus sequence. Students not entering at the calculus level will not be eligible to register for mechanical engineering courses until meeting the mathematics requirement. This may result in a delay in graduation.

General Education Requirements

Students working toward the Bachelor of Science degree must complete 8 of the 9 General Education Objectives (a minimum of 36 credits). See the General Education Requirements (http://coursecat.isu.edu/undergraduate/academicinformation/generaleducation) in the Academic Information section of the catalog.

Fundamentals of Engineering (FE) Exam

Mechanical engineering students are encouraged to take the Fundamentals of Engineering (FE) exam during their senior year, while the breadth of the engineering material covered on the examination is still fresh in their minds. This exam is considered the first step in professional licensure for engineers.

Mechanical Engineering Academic Rules and Policies

Every Mechanical Engineering student is encouraged to meet with a faculty member for academic advising prior to registration each semester. A student who pursues a double major should regularly consult with a faculty member from each of the two major programs.

A new student who wants to transfer into the Mechanical Engineering major must have prior coursework evaluated for transfer credit before matriculating into the program. A current Idaho State University Mechanical Engineering major student who intends to transfer an engineering course to Idaho State University must obtain prior approval for the transfer either via transfer credit review (petition process) or through existing program articulation. Articulated courses are listed on the Registrar's web page.

• Transfer credits must be posted to the student’s ISU transcript prior to registering for any course that has the transfer course credits as a prerequisite or co-requisite.

A student requesting a credit limit overload must apply using the Application for Credit Limit Overload Form that can be found on the Mechanical Engineering website. The minimum requirement is a 3.0 GPA or greater for engineering courses taken over the past two semesters. The completed form must then be submitted to the Chair of Mechanical Engineering for approval.

A student who enrolls in an engineering class while petitioning for a waiver of applicable prerequisites must secure the waiver by the end of the first week of classes or be dropped from the course in question.

Any student missing the first week of a mechanical engineering class, in any semester, will be dropped from that course.

To maintain “academic satisfactory progress” and avoid academic probation and/ or academic dismissal, undergraduate students must maintain a cumulative Idaho State University GPA of 2.0 or higher every semester.

Accreditation

The Bachelor of Science (B.S.) program in Mechanical Engineering (ME) is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Educational Objectives for Degree Program in Mechanical Engineering

Five years after they graduate, our Mechanical Engineering graduates should:

• Professional and Social Responsibility – demonstrate professionalism and ownership of their work and be an active and positive influence in their community.

• Professional Leadership – balance the relationship between business and engineering and interface with multidisciplinary teams to achieve the combined objective.

• Career Development and Professional Growth – pursue lifelong learning, professional affiliations, and increasing responsibility in the workplace.

Faculty

Chair and Associate Professor

Perez Graecia, M. Alba,* Chair and Associate Professor, Mechanical Engineering; Associate Director, Measurement and Control Engineering Research Center. B.S. 1996, Technical University of Catalonia, Barcelona, Spain; M.S. 1999, Ph.D. 2003, University of California-Irvine. (2004)

Professors

Bosworth, Kenneth W.,* Associate Chair and Professor, Mechanical Engineering; Director of the M.S. in Measurement and Control Engineering Program. B.S. 1977, M.S. 1980, Ph.D. 1984, Rensselaer Polytechnic Institute. (1992)

Schoen, Marco P.,* Professor, Mechanical Engineering; Director, Measurement and Control Engineering Research Center. B.S. 1989, Swiss College of Engineering, Muttenz, Switzerland; M.E. 1993, Widener University; Ph.D. 1997, Old Dominion University. (2001)


Associate Professor

Wabrek, Richard M.,* Associate Professor, Mechanical Engineering; Adjunct Faculty, Sport Science and Physical Education. B.S. 1971, Valparaiso University; M.S. 1976, University of Vermont; Ph.D. 1985, New Mexico State - University. (1989)
Assistant Professor
Sebastian, Anish, Assistant Professor, Mechanical Engineering; Director of the M.S. in Mechanical Engineering Program. B.S. 2002, University of Pune; M.S. 2010, Ph.D. 2012, Idaho State University. (2012)

Senior Lecturer
Hofle, Mary M., Senior Lecturer, Mechanical Engineering. B.S. 1982, University of Akron; M.S. (2) 1984, Rensselaer Polytechnic Institute. (1998)

Lab Technician
Wilson, Kellie N., Teaching Lab Technician and Coordinator, Mechanical Engineering. B.S. 2009, Idaho State University; M.S. 2011, Idaho State University. (2017)

Adjunct Faculty
Walters, Tom

Affiliate Faculty
Lin, Feng
Maidana, Carlos
Potluri, Chandu

Bachelor of Science in Mechanical Engineering

Including the University General Education Requirements listed elsewhere (8 of the 9 General Education Objectives, a minimum of 36 credits—see the General Education Requirements (http://coursecat.isu.edu/undergraduate/academicinformation/generaleducation) in the Academic Information section of this catalog), the program of study for the Bachelor of Science in Mechanical Engineering degree totals a minimum of 120 credits as follows:

Additional Mathematics and Science Course Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1170</td>
<td>Calculus I (Satisfies General Education Objective 3)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1175</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2240</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2275</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3360</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1111</td>
<td>General Chemistry I (Partially satisfies General Education Objective 5)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1111L</td>
<td>General Chemistry I Lab (Partially satisfies General Education Objective 5)</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 2211</td>
<td>Engineering Physics I (Partially satisfies General Education Objective 5)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 2212</td>
<td>Engineering Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

The three previous courses together satisfy Objective 5.

Mechanical Engineering Course Requirements:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE/ME 2210</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>EE 2240</td>
<td>Introduction to Electrical Circuits</td>
<td>3</td>
</tr>
<tr>
<td>CE/ME 3350</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>CE 3360</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>or CE 3361</td>
<td>Engineering Economics and Management</td>
<td>3</td>
</tr>
<tr>
<td>ME 1105</td>
<td>Solid Modeling</td>
<td>2</td>
</tr>
<tr>
<td>ME 1165</td>
<td>Structured Programming</td>
<td>2</td>
</tr>
<tr>
<td>CE/ME 2220</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 2266</td>
<td>Symbolic Programming</td>
<td>1</td>
</tr>
<tr>
<td>ME 3307</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 3320</td>
<td>Kinematics and Dynamics of Machinery</td>
<td>3</td>
</tr>
<tr>
<td>ME 3322</td>
<td>Mechanical Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>ME 3323</td>
<td>Machine Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 3325</td>
<td>Advanced Machine Design</td>
<td>3</td>
</tr>
<tr>
<td>CE/ME 3341</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 4406</td>
<td>Measurement Systems Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>ME 4440</td>
<td>Vibration Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME 4443</td>
<td>Thermal Fluids Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ME 4463</td>
<td>Mechanical Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 4465</td>
<td>Thermal Fluid System Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 4473</td>
<td>Mechanical Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME 4476</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME 4496A</td>
<td>Project Design I</td>
<td>3</td>
</tr>
<tr>
<td>ME 4496B</td>
<td>Project Design II</td>
<td>3</td>
</tr>
<tr>
<td>ME Electives</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

1 Course may involve evening examinations and/or presentations.
2 Students are to consult with their advisors and choose courses which will complement their engineering education.

For students interested in focusing their ME degree in the Biomedical area, suggested electives are:

BIO1 3301 & 3301L | Anatomy and Physiology and Anatomy and Physiology Lab | 4 |

For students interested in focusing their ME degree in the Systems area, suggested electives are:

MATH 3350 | Statistical Methods | 3 |
MATH 3352 | Introduction to Probability | 3 |
MATH 4421 | Advanced Engineering Mathematics I | 3 |
ME 3355 | System Dynamics | 3 |
ME 4415 | Model Theory | 3 |
ME 4425 | Mechatronics | 3 |

For students interested in focusing their ME degree in the Thermal/Fluids area, suggested electives are:

CE 4435 | Hydraulic Design | 3 |
ME 4416 | Thermal Power Cycles | 3 |
ME 4451 | Compressible Fluid Flow | 3 |

For students interested in focusing their ME degree in the Robotics and Mechanical Design area, suggested electives are:

CE 4431 | Advanced Mechanics of Solids | 3 |
ME 3353 | Manufacturing Processes | 3 |
ME 4425 | Mechatronics | 3 |

For students interested in focusing their ME degree in the Energy area, suggested electives are:

MATH 4421 | Advanced Engineering Mathematics I | 3 |
NE 3301 | Nuclear Engineering I | 3 |
Department of Mechanical Engineering

Courses

**ME 1105 Solid Modeling: 2 semester hours.**
Introduction to the fundamentals of Solid Modeling. Sketching, features, modeling, assemblies, and drawings. Minimum grade C-. PREREQ: MATH 1147. F, S

**ME 1165 Structured Programming: 2 semester hours.**
Introduces concepts of structured programming via top-down design concepts, in an interpreted programming environment. Covers conditionals, loop structures, function modules, array processing, structures, input and output of data, and graphical visualization, with applications to engineering problems. Minimum grade C-. PREREQ: MATH 1170. F, S

**ME 2210 Engineering Statics: 3 semester hours.**
Concepts of force vectors and equilibrium with emphasis on free body diagrams. Trusses, beams, frames, centroids, fluid statics, and friction. Equivalent to CE 2210. PREREQ: CE 1105 or ME 1105 (Minimum grade of C- or better required for ME 1105); PHYS 2211; and MATH 1175. F, S

**ME 2220 Engineering Dynamics: 3 semester hours.**
Principles of kinetics. Angular and linear displacement, velocity, and acceleration analysis. Rigid bodies in motion and types of motion. Application of principles of force-mass acceleration, work-kinetic energy, and impulse-momentum to solution of problems of force systems acting on moving particles and rigid bodies. Equivalent to CE 2220. PREREQ: ME 2210 or CE 2210, PHYS 2211, CE 1105 or ME 1105, and MATH 1175. F, S

**ME 2266 Symbolic Programming: 1 semester hour.**
Introduces a symbolic programming language, with emphasis on algebraic, calculus, and linear algebraic manipulations and visualization, with engineering applications. PREREQ: MATH 1175. PRE-or-COREQ: ME 1165 (Minimum grade of C- or better required for ME 1165) and MATH 2240. S

**ME 3307 Thermodynamics: 3 semester hours.**
Fundamental concepts of thermal energy equations. Applications to ideal and real gases, liquids, and solids in static and transient systems. PRE-or-COREQ: MATH 2275. PREREQ: ME 2220. F, S

**ME 3320 Kinematics and Dynamics of Machinery: 3 semester hours.**
Kinematic analysis of cams, gears, and linkages; velocity, acceleration, and force analysis; kinematic synthesis and design of mechanisms; balancing; computer-aided analysis and synthesis. PRE-or-COREQ: MATH 2275. PREREQ: ME 1165, ME 2266, ME 2220, and MATH 2240. F

**ME 3322 Mechanical Engineering Materials: 3 semester hours.**
Material properties, metals, alloys, phase diagrams, heat treatment, material testing and material applications. PRE-or-COREQ: CE 3350 or ME 3350. PREREQ: CE 2210 or ME 2210, MATH 1175, CHEM 1111 and CHEM 1111L. F, S

**ME 3323 Machine Design: 3 semester hours.**
Design of mechanical components subject to static and fatigue loads. Design using screws, fasteners, springs, bearings, and welds. Computer-aided design using finite element methods. PREREQ: CE/ME 3350. PRE-or-COREQ: ME 3322 and ME 3320. F

**ME 3325 Advanced Machine Design: 3 semester hours.**
Statistical methods for design, failure analysis, advanced machine component design. PREREQ: ME 3320 and ME 3323. S

**ME 3341 Fluid Mechanics: 3 semester hours.**
Fluid statics, incompressible fluid flow, open channel flow, compressible fluid flow, pipe flow, flow measurements, pumps, valves, other devices. Equivalent to CE 3341. PREREQ: ME 2220 and MATH 3360. S

**ME 3350 Mechanics of Materials: 3 semester hours.**
Theories of stresses and strains for ties, shafts, beams, columns and connections. Determination of deflections and the investigation of indeterminate members. An introduction to design. Equivalent to CE 3350. PREREQ: CE 2210 or ME 2210, PHYS 2211, CE 1105 or ME 1105, and MATH 1175. F, S

**ME 3353 Manufacturing Processes: 3 semester hours.**
Production techniques and equipment. Casting, molding, pressure forming, metal removal, joining and assembly, automation and materials handling. Field Trips. PREREQ: ME 2222. D

**ME 3355 System Dynamics: 3 semester hours.**
Modeling and representations of dynamic 3-dimensional physical systems emphasizing rigid bodies; transfer functions, block diagrams, state equations. Transient response. PREREQ: ME 2220 and MATH 3360. D

**ME 4405 Measurement Systems Design: 3 semester hours.**
Introduction to instrumentation systems analysis and design, including statistical analysis, system modeling, actuators, transducers, sensor systems, signal transmission, data acquisition, and signal conditioning. PREREQ: MATH 3360. D

**ME 4406 Measurement Systems Laboratory: 1 semester hour.**
Principles of measurement, measurement standards and accuracy, detectors and transducers, digital data acquisition principles, signal conditioning systems and readout devices, statistical concepts in measurement, experimental investigation of engineering systems. PREREQ: MATH 3360 and EE 2240. S

**ME 4415 Model Theory: 3 semester hours.**
Theory of design and testing of scaled system models. Dimensional analysis with application to physical models. True and distorted models, linear and nonlinear models and analogies. Laboratory work required. Equivalent to ENGR 4415. PREREQ: ME 3341 and CE/ME 3350. D

**ME 4416 Thermal Power Cycles: 3 semester hours.**
Application of thermodynamics to design of systems for conversion of thermal energy to power by various power cycles. PREREQ: ME 3307. D

**ME 4425 Mechatronics: 3 semester hours.**
Basic kinematics, sensors, actuators, measurements, electronics, microprocessors, programmable logic controllers, feedback control, robotics and intelligent manufacturing. PRE-or-COREQ: ME 4473 or EE 4473 and PREREQ: MATH 3360. D

**ME 4440 Vibration Analysis: 3 semester hours.**
Free vibration and forced response of single and multiple degree of freedom systems, normal modes, random vibrations, discrete, lumped mass, and continuous systems. Vibration control techniques. PREREQ: MATH 2275 and MATH 3360. PRE-or-COREQ: ME 3325. F

**ME 4443 Thermal Fluids Laboratory: 1 semester hour.**
Measurement of thermal and fluid properties, experiments on fluid flow and heat transfer systems. PREREQ: ME 3307, CE/ME 3341, and ME 4476. F

**ME 4451 Compressible Fluid Flow: 3 semester hours.**
Fundamentals and practical applications of compressible fluid flow and gas dynamics; techniques for isentropic friction, heat addition, isothermal flow, shock wave analysis, propagation, expansion waves, reflection waves. PREREQ: ME 3307 and ME 3341. D

**ME 4463 Mechanical Systems Design: 3 semester hours.**
Application of engineering concepts and principles to the design of mechanical systems, including economic, environmental, sustainability, and societal considerations. PREREQ: ME 3320, ME 3323, ME 3325, and ME 4440. S
**ME 4464 Engineering Numerical Techniques: 3 semester hours.**
Numerical methods for solving linear and nonlinear systems of equations, data fitting and smoothing, numerical integration and differentiation, initial and boundary value problems, and optimization. Stresses engineering applications and programming projects. PREREQ: ME 1165, MATH 2240, MATH 2275, and MATH 3360. D

**ME 4465 Thermal Fluid System Design: 3 semester hours.**
Application of engineering concepts and principles to the design of thermal and fluid systems, including economic, environmental, sustainability, and societal considerations. PREREQ: ME 3307, CE/ME 3341, and ME 4476. F

**ME 4473 Mechanical Control Systems: 3 semester hours.**
Discrete and continuous time control system design, signal processing, embedded systems. PREREQ: ME 2220, EE 2240, PHYS 2212, MATH 3360, and ME 4440. S

**ME 4476 Heat Transfer: 3 semester hours.**

**ME 4480 Mechanical Engineering Seminar: 1 semester hour.**
Project management, conceptual design, industry interaction, current topics in Mechanical Engineering. PREREQ: Approval of application for admission to course. F

**ME 4481 Independent Problems: 1-3 semester hours.**
Students are assigned to, or request assignment to, independent problems on the basis of interest and preparation. May be repeated for a maximum of 6 credits. PREREQ: Permission of instructor. D

**ME 4496 Project Design: 3 semester hours.**
The course is designed to give student teams experience solving an engineering problem involving the synthesis of a solution to meet the specified design requirements. PREREQ: CE 3360. S

**ME 4496A Project Design I: 3 semester hours.**
Semester one of a two semester sequence dealing with the conceptual design of multi-disciplinary projects requiring multi-disciplinary teams. PREREQ: Approval of application for admission to course. PRE-or-COREQ: CE 3360 or CE 3361. F

**ME 4496B Project Design II: 3 semester hours.**
Continuation of design sequence dealing with the design, analysis, implementation, and consequences of multi-disciplinary projects. PREREQ: ME 4496A. S

**ME 4499 Experimental Course: 1-3 semester hours.**
This is an experimental course. The course title and number of credits are noted by course section and announced in the class schedule by the scheduling department. Experimental courses may be offered no more than three times. May be repeated.