Graduate Student Handbook
Department of Mechanical & Biomedical Engineering

Master of Science in Mechanical Engineering (MSME)

Master of Engineering in Mechanical Engineering (MEngME)

Contact Information for the MBE Graduate Programs:

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Introduction

Welcome to the department of Mechanical and Biomedical Engineering at Boise State University. We are proud to offer two graduate degrees at the masters level. The Masters of Science (MS) degree is a traditional thesis-based degree which culminates in the development and presentation of an independent and novel research project. The Masters of Engineering (MENGR) degree does not require a thesis and culminates in a comprehensive examination. This handbook is intended to inform the student on the processes and procedures required for the attainment of a graduate degree from our department.

Disclaimer: The Boise State University Graduate Catalog

This document is intended to serve as a handy and comprehensive resource for students in the Mechanical Engineering graduate programs. While every effort is made to ensure the information contained in this manual is both accurate and timely, the official Graduate Student Catalog of Boise State University contains the definitive information about all programs at the university. In the case where information provided in our manual conflicts with the official catalog, *the catalog will prevail*. Students are encouraged to find the catalog online and be familiar with the information it contains.

Degree Requirements

The Core

The faculty of the MBE department has determined that our graduate programs, and the students enrolled in them, are best served by requiring specific courses to serve as a core of the program. Of the 30-31 credits required for a Masters degree, 9 of them (3 courses), are dedicated to meeting the core requirement. Since the core is designed to form the foundation for graduate studies, *students are strongly advised to meet these core requirements in their first year of graduate study*. These requirements are discussed in more detail in the following sections.

Continuum Mechanics (ME 510)

While all students entering the Master of Science or Master of Engineering programs will have had many undergraduate courses in mechanics, the study of continuum mechanics lays the theoretical and mathematical foundation for the general field of mechanics as viewed on the continuum whether it is solid or fluid mechanics. Regardless of your research interests, or current field of employment, this course will serve as an important building block for courses to follow.

Applied Mathematics Core (MATH 527 or MATH 536)

The most important characteristic that distinguishes undergraduate courses from graduate study is the level of mathematical rigor associated with the analysis. These courses are modeled after courses that can be found in graduate engineering curricula across the country and were developed in consultation with engineering faculty.

Computational Core

Computational methods are commonly adopted in a range of fields for the analysis of complex engineering systems. Whether data are generated through simulation or experimentation, engineers also need to process and manipulate them for problem solving and reasoning using mathematical and/or statistical methods. Therefore, our graduate program requires students to demonstrate proficiency in problem solving using computational methods and computer programming. Note that a simulation-intensive course where canned software is used as a black-box does not meet the computational core course requirements. Several course options are available to our students to meet this requirement and students are encouraged to consult with their advisor to find the class most appropriate to their course of study.

Exceptions to the Core Requirements

On rare occasions, the graduate committee of the Mechanical and Biomedical Engineering department will approve exceptions to the core requirements when a strong case can be made to support the request. An example is if the student took the 400-level version of a computational class as an undergraduate (e.g. 470 or 471) and earned a B+ or better in this course. In such cases, the Computational Core requirement is waived and the student is free to choose another graduate course in its place.

Mechanical Engineering Graduate Courses

The remainder of the courses used to meet the requirements should be chosen in consultation with the student's major advisor and should be consistent with their educational goals. The Mechanical Engineering Graduate Courses (6-15 credits) are to be chosen from the list of ME classes at the 500 level. Please note: some of our courses are cross-listed as 400/500 level. If a student took the 400 level version of the course as an undergraduate, they are not eligible to use the 500 level version of the same course to apply to this requirement. Finally, no more than 3 credits (TOTAL) of Independent Study (ME 596) or Directed Research (ME 696) can be applied to this requirement.

Non-Mechanical Engineering Graduate Courses:

Students also have the option of taking up to 9 credits of non-ME graduate courses to fulfill graduation requirements. Of those, 6 credits may be at the undergraduate level (300 or 400 level, B or better required) with the approval of the student's advisor.

Thesis Credits Requirements (MS Degree)

A minimum of 6 credits of thesis work (ME 593) are required for a MS degree, but it is common for students to have an excess of thesis credits. Students should consult with their major advisor before enrolling for thesis credits and determine the appropriate number for any given semester. Students must be enrolled in at least 1 credit of thesis in the semester in which they defend their thesis.

Comprehensive Exam (MEng Degree)

In their final semester of graduate work, students enrolled in the Masters of Engineering program must enroll in ME 690 Master's Comprehensive Examination. As early as possible in the semester, these students should meet with their advisor (typically the graduate coordinator) and begin making plans for the Comprehensive Examination.

Masters of Science Degree Requirements, Catalog Statement[1]

Degree Requirements

Master of Science in Mechanical Engineering	
Course Number and Title	*Credits*
Mechanical Engineering and Mathematics Core	
MATH 527 Introduction to Applied Mathematics for Scientists and Engineers or MATH 536 Partial Differential Equations or MATH 537 Principles of Applied Mathematics	3
ME 510 Continuum Mechanics	3
Select one of the following courses: MATH 565 Numerical Methods I MATH 571 Data Analysis MATH 572 Computational Statistics ME 536 Computational Fluid Dynamics ME 570 Finite Element Methods ME 571 Parallel Scientific Computing Another course with a computational emphasis approved by the student's advisor.	3
Mechanical Engineering Graduate Courses Courses with ME prefix to be selected with student input and approved by the supervisory committee.	6-15
Non-Mechanical Engineering Graduate Courses Graduate courses in a related field. Masters students may take up to 6 credits of upper division (300 level and above) undergraduate courses. Advisor approval required.	0-9
Culminating Activity	
ME 593 Thesis	6
Total	30

[1] From the 2019-2020 Graduate Catalog

Masters of Engineering Degree Requirements, Catalog Statement[2]

Degree Requirements

Master of Engineering in Mechanical Engineering	
Course Number and Title	*Credits*
Mechanical Engineering and Mathematics Core	
MATH 527 Introduction to Applied Mathematics for Scientists and Engineers or MATH 536 Partial Differential Equations or MATH 537 Principles of Applied Mathematics	3
ME 510 Continuum Mechanics	3
Select one of the following courses: MATH 565 Numerical Methods I MATH 571 Data Analysis MATH 572 Computational Statistics ME 536 Computational Fluid Dynamics ME 570 Finite Element Methods ME 571 Parallel Scientific Computing Another course with a computational emphasis approved by the student's advisor.	3
Mechanical Engineering Graduate Courses Courses with ME prefix to be selected with student input and approved by the supervisory committee.	12-21
Non-Mechanical Engineering Graduate Courses Graduate courses in a related field. Masters students may take up to 6 credits of upper division (300 level and above) undergraduate courses. Advisor approval required.	0-9
Culminating Activity	
ME 690 Master's Comprehensive Examination	1
Total	31

[2] From the 2019-2020 Graduate Catalog

How to Obtain your MS or MENG Degree: Timeline

Upon admission to one of our Masters programs, you should schedule an appointment with your advisor. If you have not already established a relationship with one of the graduate faculty (see appendix) in the department, you should schedule a meeting with the graduate coordinator. Unless other appropriate arrangements are made by the student, all Masters of Engineering candidates are advised by the graduate coordinator.

While there are many similarities between the requirements for the MS and MEng degree, there are significant differences when it comes to advising. For the MS degree, the thesis advisor plays an active role in selecting courses and, of course, guiding the research project. Students are encouraged to seek out a thesis advisor as soon as possible after being admitted to the program.

Masters of Science Program Timeline

The flow chart on the following page shows a 2 year course of study which is typical for MS students, however, everyone's situation is different and some deviation is to be expected.

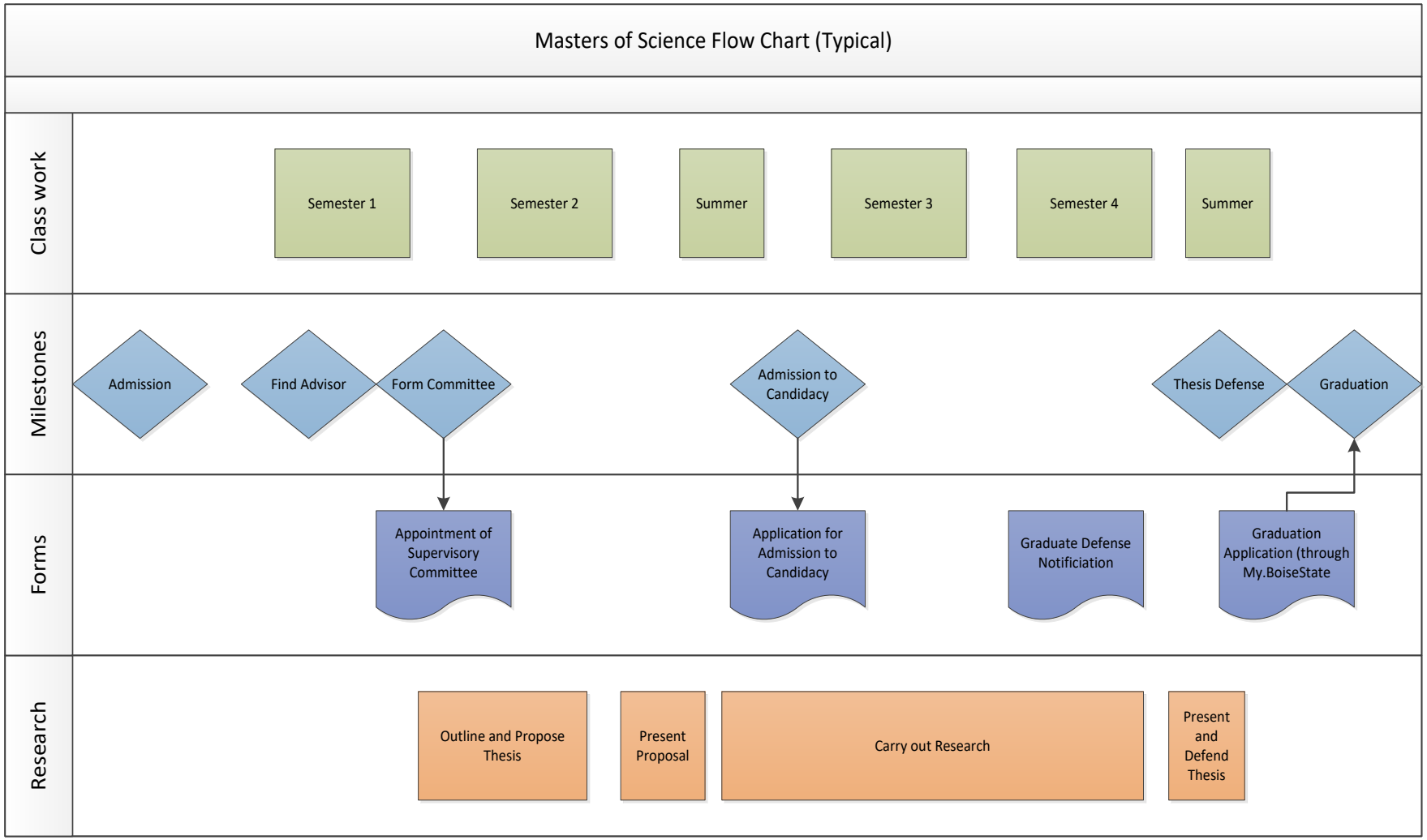


Figure 1: Typical Masters of Science Program Timeline

Masters of Engineering Program Timeline

The Masters of Engineering program is not thesis-based so the process is simplified somewhat. There is no supervisory committee (the department graduate committee fulfills that role) and a comprehensive exam is administered during the final semester. Figure 2 shows the timeline for the Masters of Engineering degree program.

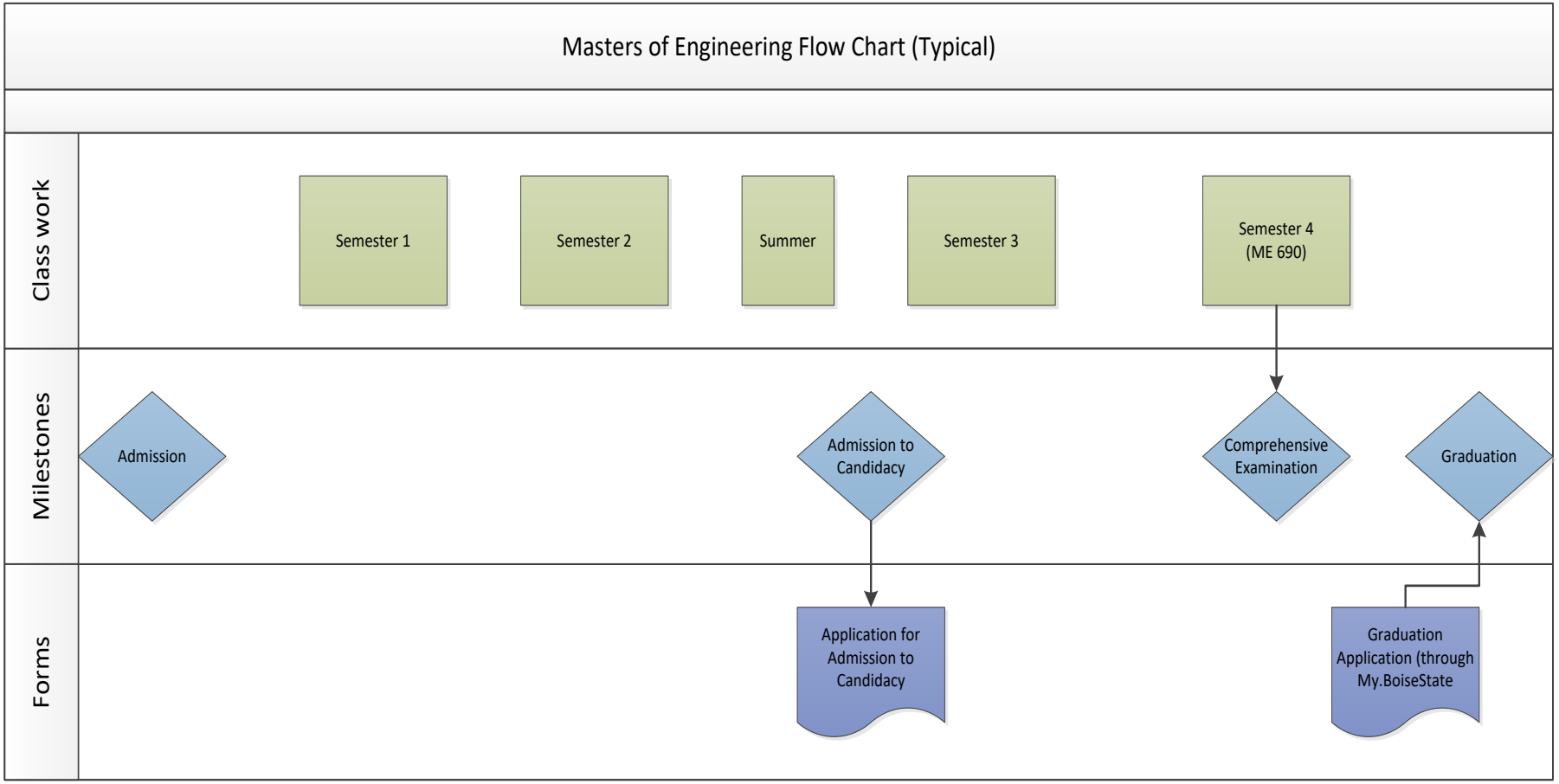


Figure 2: Typical Masters of Engineering Program Timeline

Comprehensive Exam for the Masters of Engineering Program

The graduate program coordinator is responsible for administering the Comprehensive Exam. The exam is to be based on three of the courses taken by the candidate to fulfill the program requirements. Typically, the process follows the following steps.

At the beginning of the final semester of the program (during which the student registers for ME 690: Comprehensive Examination), the student meets with her/his graduate advisor (by default the graduate coordinator) and the 3 graduate courses which provide the basis for the exam are selected. The process can be informed by student preference, but the graduate committee reserves the right to select the courses. Disagreements on topic selection will be decided by the department graduate committee. In general, courses taken by the student that are cross-listed with undergraduate courses (i.e. 400/500 level courses) are not eligible to serve as topics for the comprehensive exam.

The date for the examination is set by the graduate coordinator. If several candidates are eligible for the exam, attempts will be made to schedule them at the same time. Typically, the exam is held toward the end of the semester, however if none of the three topics address courses that the student is currently taking, the exam could be scheduled any time in the semester.

The format of the exam is typically 3 hours, proctored and open-book. The graduate coordinator will solicit appropriate problems from the faculty who taught the topical courses (or appropriate surrogates if that faculty member is not available) and will administer and proctor the examination. The worked problems will be returned to the faculty for grading and the coordinator will assemble the results. A passing grade will be achieved if each problem in the exam is graded at a 70% or higher. A passing grade on each of the three sections is required to constitute a pass of the comprehensive exam. Students will be granted one additional attempt at the examination if they do not achieve a passing grade on the first attempt.

The graduate coordinator will inform the candidate of the outcome of the examination.

Funding your Graduate Program/ Graduate Assistantships

A Research Assistant is a registered, full-time graduate student who contributes to research projects under the supervision of a faculty member, and is appointed by faculty members with available research funding.

A Teaching Assistant is a registered, full-time graduate student who assists a faculty member to teach his or her course, and is appointed by the department chair.

By contract, a student holding an assistantship is responsible for conducting research or teaching in exchange for a stipend and tuition waiver. The term of assistantship varies, depending on funding availability. Students selected as a Research or Teaching Assistant should discuss expected responsibilities with their supervisors before accepting the position.

Full time status for financial aid

Students holding assistantships are required to register for at least five (5) credit hours to maintain the full-time graduate student status. Research or Teaching Assistants appointed during summer do not have to register summer courses but must register for a minimum of five (5) credit hours in the following fall semester. If Research or Teaching Assistants take summer courses, the tuition waiver is usually not applied during the summer term. A stipend may be given to a Teaching Assistant during summer even if the course in his/her charge is not offered. In such a case, the Teaching Assistant needs to work to assist the course in the following semester(s). Duties during summer include, but are not limited to: designing new experiments, repairing/installing lab equipment, collecting pilot data, writing lab instructions and manuals.

In order to receive paychecks and to be qualified for tuition waiver on time, prospective Research or Teaching Assistants should complete all paperwork at least one month before the appointment starts. Contact the MBE Administrative Assistant listed on the cover of this manual for detailed information of the paperwork.

Health Insurance Requirements

As you may well know, the health insurance industry, and the governmental requirements for health insurance coverage have gone through many changes in the past few years. All students are required to carry a health care insurance policy that meets the standards set out by the Affordable Care Act. Students are advised to refer their questions to the student health service at Boise State.

APPENDICES

Appendix A: Graduate Courses in Mechanical & Biomedical Engineering[3]

ME 510 CONTINUUM MECHANICS (3-0-3)(F/S). Development and analysis of fundamental relationships and constitutive equations for deformation, strain, and stress of materials occupying a continuous domain. Eulerian and Lagrangian methods are covered. Vector and tensor techniques developed. PREREQ: Graduate standing or PERM/INST.

ME 520 (KINES 520) ADVANCED BIOMECHANICS (3-0-3)(F). Mechanical principles and analytical methods used in traditional and contemporary biomechanics. Topics include functional anatomy, joint kinematics, inverse dynamics, mechanical properties of biological materials, and modeling of the musculoskeletal system. May be taken for KINES or ME credit, but not both. PREREQ: ENGR 220 or PERM/INST.

ME 522 ADVANCED THERMODYNAMICS (3-0-3)(F/S). Advanced topics selected from Statistical Thermodynamics, Thermodynamics of Chemically Reacting Gases, Thermodynamics Property Formulation for Computer Applications and others at the discretion of the professor. PREREQ: ME 420.

ME 525 (KINES 525) LABORATORY TECHNIQUES IN BIOMECHANICS (3-0-3)(S). An introduction to the analysis techniques used to study the mechanics of human motion. Topics include cinematography, videography, force transducers, electromyography and computer analysis techniques. May be taken for KINES credit or ME credit, but not both. PREREQ: KINES 520/ME 520 or PERM/INST.

ME 526 RENEWABLE ENERGY SYSTEMS (3-0-3)(F/S). A survey of renewable energy systems including solar, wind biomass, as compared to traditional electric power production and distribution. PREREQ: ENGR 240, ME 302, and CE 330 or ME 330.

ME 530 ADVANCED FLUID MECHANICS (3-0-3)(F/S). Theory and physics of viscous flows. Conservation laws. Vorticity dynamics and transport. Laminar flows and elementary lubrication theory. Flow instability. Introduction to boundary layer theory and turbulence. Some exact solutions to the Navier-Stokes equations. PREREQ: ME 320 and ME 330.

ME 532 ACOUSTICS (3-0-3)(F/S). Basic theories of acoustics, wave equations, acoustic response, sound generation, transmission, and attenuation. Measurement techniques and nomenclature. PREREQ: CE 330 or ME 330, and MATH 333.

ME 536 COMPUTATIONAL FLUID DYNAMICS (3-0-3)(F/S). Theory and numerical modeling in fluid dynamics. Finite difference, finite volume, and finite element techniques will be treated. The course will include projects and research applications in engineering and environmental flows. PREREQ: CE 330 or ME 330, and PERM/INST.

ME 537 CONDUCTION HEAT TRANSFER (3-0-3)(F/S). Steady and unsteady conduction of heat through solids, liquids, and gases. Analytical and numerical solution methods for ordinary and partial differential equations modeling heat transfer. PREREQ: Graduate standing or PERM/INST.

ME 538 CONVECTIVE HEAT TRANSFER (3-0-3)(F/S). Treatment of energy and linear momentum conservation equations; laminar and turbulent forced convective HT in internal and external flow fields; free convection. PREREQ: ME 320.

ME 539 RADIATION HEAT TRANSFER (3-0-3)(F/S). Radiation heat transfer due to emission and absorption between surfaces and within materials. Analytical and numerical solutions for steady and unsteady heat transfer due to radiation as a dominant process or in combination with convection and conduction. PREREQ: Graduate standing or PERM/INST.

ME 550 ADVANCED MECHANICS OF MATERIALS (3-0-3)(F/S). Extension of stress-strain concepts to three-dimensions, plate and shell analysis, failure theories, and fatigue. Analysis and visualization techniques include Finite Element Analysis and photoelasticity. PREREQ: CE 350 or ME 350.

ME 560 COMPUTER AIDED DESIGN (3-0-3)(F/S). Computer programs used to develop 3-D CAD database for design, analysis, simulation, and manufacturing. Machinery design to meet functional, performance, reliability and manufacturing requirements. Design projects reinforce concepts and methodologies. For students desiring higher level CAD sills prior to taking ME 480. PREREQ: ME 320.

ME 561 (ECE 561) CONTROL SYSTEMS (3-0-3)(S). Time and frequency domain analysis and design of feedback systems using classical and state space methods. Observability, controllability, pole placement, and observers. May be taken for ECE or ME credit, but not both.

ME 566 DYNAMIC MODELING AND CONTROL OF ENGINEERING SYSTEMS (3-0-3)(F/S/SU). Multi-physics modeling of lumped parameter systems. Theoretical basis of system response including classical differential equations, state space methods, Laplace and frequency domain approaches. Closed loop stability and overview of SISO control system specification and design. Emphasis on computer simulation and model verification. PREREQ: Graduate standing or PERM/INST.

ME 570 FINITE ELEMENT METHODS (3-0-3)(F/S). Theoretical development of finite element methods, solution algorithm formulation, and problem solving in stress analysis, heat transfer, and fluid flow. PREREQ: ENGR 220, and CE 350 or ME 350, and PERM/INST.

ME 571 PARALLEL SCIENTIFIC COMPUTING (3-0-3)(F/S). Introduction to parallel scientific and technical computing on supercomputers and modern graphics processing units. Finite difference methods to solve partial differential equations governing heat conduction and wave propagation. Scientific visualization of simulation data. Performance optimization of scientific codes. Course projects involve parallel computer programming of prototype problems. PREREQ: CS 117, MATH 333, or PERM/INST.

ME 574 ADVANCED VIBRATIONS (3-0-3)(F/S). Theory and applications of vibrating continuous and discrete multi degree of freedom systems, modal analysis, acquisition and synthesis of data. Experimental and analytical characterization of the vibration response of linear and nonlinear systems, including Transfer and Frequency Response Functions, MIMO and SIMO, and mathematical modeling. PREREQ: ME 472 or PERM/INST.

ME 576 ADVANCED DYNAMICS (3-0-3)(F/S). Analytical modeling to predict the performance of linked, multi-body mechanical systems undergoing large displacements and rotations. Theoretical considerations in preparing models for computer simulations and interpreting results. Application of a state of the art computer package in creating realistic simulations. PREREQ: ME 380 or PERM/INST.

ME 577 (BIOL 577)(MSE 577) BIOMATERIALS (3-0-3)(F/S). Theory of biomaterials science. Medical and biological materials and their applications. Selection, properties, characterization, design and testing of materials used by or in living systems. May be taken for BIOL, ME, or MSE credit, but not from more than department. PREREQ: MSE 245 or CHEM 112.

ME 578 DESIGN AND ANALYSIS OF MECHATRONIC SYSTEMS (3-0-3)(F/S). Design and analysis of engineering systems containing mechanical, electro-mechanical and embedded computer elements. The course provides an overview of basic electronics, digital logic, signal processing and electromechanical devices. Fundamentals of event-driven programming will also be covered. PREREQ: ENGR 240.

ME 582 OPTIMAL DESIGN (3-0-3)(F/S). Analytical and computer methods used to provide optimal design of products or processes. Formulation, specification, figures of merit, controllable variables, constraints and relationships among design variables. Single and multi-variable optimization algorithms using linear and nonlinear programming methods to design problems in structures, machine components, and energy systems. PREREQ: MATH 275, PHYS 211, and PHYS 211L.

ME 585 VEHICLE DESIGN (3-0-3)(F/S). Subsystem design for wheeled vehicles including bicycles, motorcycles, cars, trucks and ATVs. Static and dynamic analyses of traction and reaction forces during acceleration, braking and cornering. Suspension response analysis. Subsystem design including suspension, chassis, steering, transmission, brakes, and tires. PREREQ: ENGR 220, MSE 245, and CE 350 or ME 350.

ME 602 MECHANOBIOLOGY (3-0-3)(F/S). Describes methods to quantify and predict ways that cells detect, modify, and respond to physical stimulus within the cellular environment. Covers topics in cell biology, statistics, and solid and fluid mechanics with a special emphasis on experimental and computational approaches to model cellular environments and whole cell mechanics. PREREQ: MATH 333 or PERM/INST.

[3] From the 2019-2020 Graduate Catalog

Appendix B: Graduate Program Forms and Instructions

Up to date forms can be found at the Graduate college web site:

https://www.boisestate.edu/graduatecollege/forms/

When provided, we encourage students to use the electronic versions of the forms.

Links to Electronic Forms frequently used by graduate students:

- Forming a thesis committee: Appointment of Supervisory Committee
- Candidacy (Course plan approval): Application for Admission to Candidacy
- Transferring courses from another university: Request for Approval of Transfer Credits
- Exceptions to Degree Requirements: Request for Adjustment of Academic Requirements
- Independent Study: Application for Graduate Independent Study

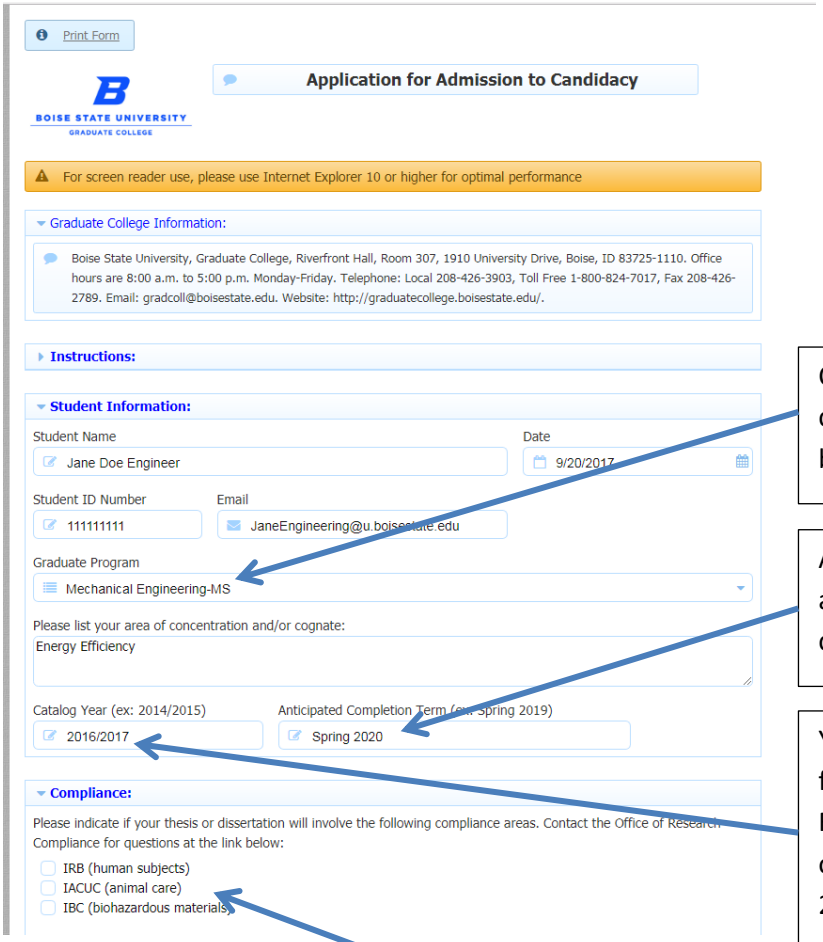
When in doubt about the form needed, or the proper preparation and routing of a form, please contact the program graduate coordinator or administrative assistant listed on the cover of this manual.

Instructions for Filling out the Application for Admission to Candidacy

What is it: The Application for Admission to Candidacy is the process by which we certify that your coursework meets the degree requirements and that you are prepared to carry out thesis research. The process consists of filling out the on-line application form which must be approved by the graduate coordinator and the graduate college.

When to file: By the time you've signed up for your 3rd semester of coursework, you probably have a good idea of what graduate courses you'll be taking to fulfill the requirements of our program. That would be a good time to file your Application for Admission to Candidacy. For Fall admits, that would be April of your 2nd semester. For Spring Admits, October of that year.

Here are some screen shots of the electronic version of the form to give you some guidance:

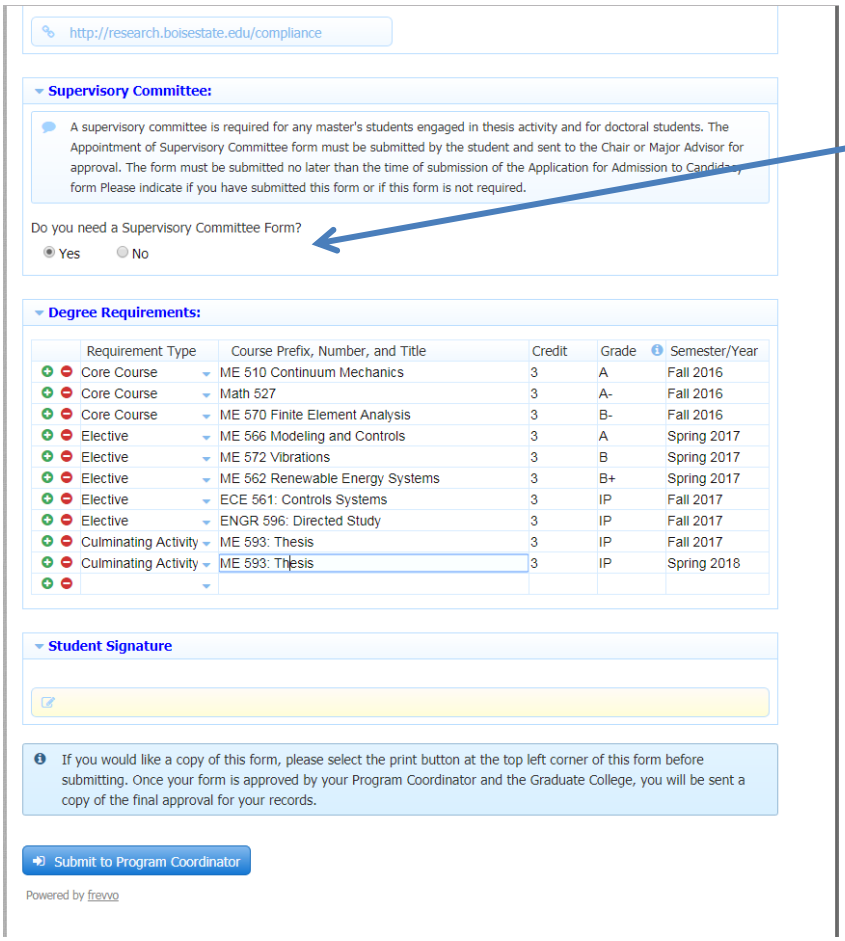


Choose the correct program. We currently have two: MS is thesis-based, MEngr is not.

An estimate of your graduation is all we ask for. It's not a binding contract.

Your catalog year is based on the first semester you were enrolled. For example, if you started in Fall of 2017, your catalog is 2017/2018.

Your advisor will know if your thesis research will need IRB or other kind of compliance issues.

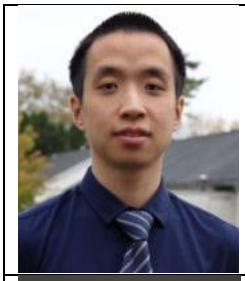
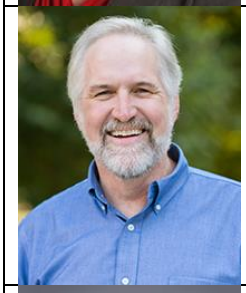


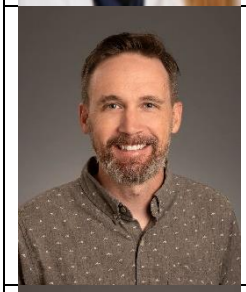
"YES" for MS, "NO" for MEngr

List courses in any order. Make sure you designate the 3 "Core Courses". Thesis credits are "Culminating Activity". Everything else is "Elective".

For courses not yet taken, list IP for the grade. These courses can change if course offerings or your direction change.

Appendix C: Graduate Faculty in Mechanical & Biomedical Engineering

	**Zhangxian (Dan) Deng** *Assistant Professor* zhangxiandeng@boisestate.edu 208-426-4187 | RUCH 208	Smart materials and system dynamics.
	**James Ferguson** *Associate Professor* jferguson@boisestate.edu 208-426-3679 | RUCH 204	Inverse methods in heat transfer and mixed convective cooling.
	**Clare Fitzpatrick** *Assistant Professor* clarefitzpatrick@boisestate.edu 208-426-4027 | RUCH 206	Musculoskeletal Biomechanics and Finite Element Methods. Director of the Computational Biosciences laboratory.
	**John Gardner** *Professor* jgardner@boisestate.edu 208-426-5702 | RUCH 201	Systems and controls applied to energy systems and the smart grid. Director of the CAES Energy Efficiency Research Institute.
	**Joe Guarino** *Professor* jguarino@boisestate.edu 208-426-3042 | RUCH 203	Vibrations, acoustics, modal analysis and biomedical engineering.

	**Trevor Lujan** *Assistant Professor* *Graduate Program Coordinator* trevorlujan@boisestate.edu 208-426-2857 | RUCH 235	Biomechanics applied to tissue. Director of the Northwest Tissue Mechanics Laboratory.
	**Mahmood Mamivand** *Assistant Professor* mahmoodmamivand@boisestate.edu 208-426-4193 | RUCH 232	Multi-scale modeling of materials. Director of the Computational Materials Engineering laboratory.
	**Erin Mannen** *Assistant Professor* erinmannen@boisestate.edu 208-426-5681 | MEC 403B	Biomechanics of infants Director of the Boise Applied Biomechanics of Infants laboratory.
	**Todd Otanicar** *Associate Professor* toddotanicar@boisestate.edu 208-426-1051 | ERB 4139	Thermo, Solar Energy. Director of the Thermal Transport and Solar Energy Laboratory.
	**Krishna Pakala** *Assistant Professor* krishnapakala@boisestate.edu 208-426-4005 | RUCH 203	Engineering Education, Thermal-Fluids Director of the Industrial Assessment Center

	**Don Plumlee** *Chair/Associate Professor* dplumlee@boisestate.edu 208-426-3575 | RUCH 201A	Low-Temperature Co-Fired Ceramics (LTCC) used for sensors, micro-thrusters and other applications. Director of the Ceramic MEMS (C-MEMS) laboratory.
	**Aykut Satici** *Assistant Professor* aykutsatici@boisestate.edu 208-426-2388 | RUCH 233	Robotics, dynamical systems, and control. Director of the Robot Control laboratory.
	**Gunes Uzer** *Assistant Professor* gunesuzer@boisestate.edu 208-426-4461 | RUCH 205	Cellular level mechanics for regenerative medicine. Director of the Mechanical Adaptations laboratory.
	**Ralph Budwig** *Adjunct Graduate Professor* *University of Idaho in Boise*	Fluid dynamics, turbulence, measurement techniques.

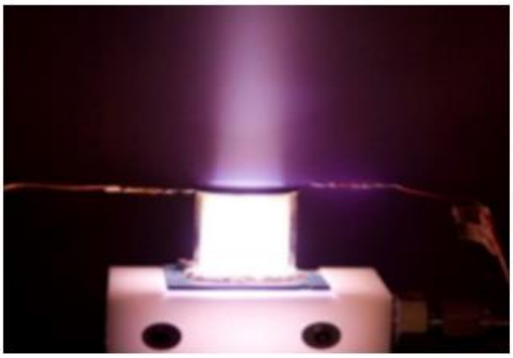
Appendix D: Research Labs

Boise Applied Biomechanics of Infants Laboratory (BABI)
Director: Dr. Erin Mannen
Website:

We study babies! The goal of our research is to understand how infant biomechanics impacts musculoskeletal development and safety. Specifically, our team hopes to improve understanding and treatment of infant hip dysplasia and abnormal spine development, and seek to understand how common baby gear impacts infant movement and safety. We utilize biomechanical experimental techniques such as motion capture, electromyography, force platforms, and image analysis to quantify infant movement. Our collaborative research relies on multidisciplinary teams of orthopaedic surgeons, pediatricians, and creative engineers.

CAES Energy Efficiency Research Institute (CEERI)
Director: Dr. John Gardner
Website: https://www.boisestate.edu/ceeri/

CEERI is a state-wide collaboration focusing on the efficient and effective use of energy resources. CEERI researchers contribute in a broad range of fields including renewable energy, smart grid applications, commercial refrigeration systems and building energy management. In addition, CEERI is home to the Industrial Assessment Center, a partnership that trains engineering students to improve the efficiency of industrial processes.



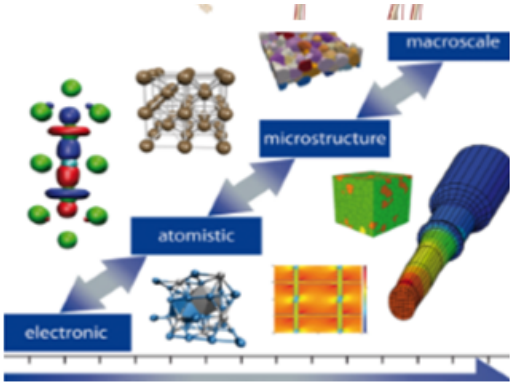
C-MEMS Lab
Director: Dr. Donald Plumlee
Website: https://www.boisestate.edu/coen-cmems/

The Ceramic Microelectrical Mechanical Systems (C-MEMS) lab uses Low Temperature Co-fired Ceramics (LTCC) to develop ceramic devices for novel applications. Dr. Donald Plumlee supervises the laboratory activities that are conducted by undergraduate and graduate researchers at Boise State University. The C-MEMS laboratory personnel design, fabricate and test LTCC devices. A few of the lab projects include work in microfluidic channels, thermoelectric generators, plasma microthrusters and plasma medical devices.

Computational Biosciences Lab

Director: Dr. Clare Fitzpatrick
Website: https://www.boisestate.edu/coen-cbl/

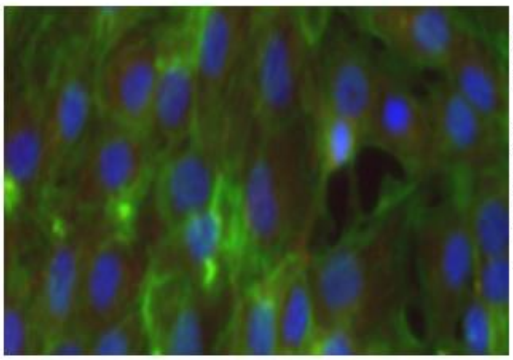
Research at the Computational Biosciences Laboratory (CBL) focuses on applying computational models to understand the mechanisms of disease, injury and degeneration, and designing targeted treatment options and surgical interventions to address clinical issues and athlete performance. We work in close collaboration with surgeons and experimentalists to gather data to develop and validate our models, and then use these models to predict how our body will behave during different activities, or how it may change as a result of injury or surgical intervention.



Computational Materials Design Lab

Director: Dr. Mahmood Mamivand
Website: https://mamivand.weebly.com/

At the CMD lab we develop physics-based and data-driven models to understand the inter-relationships between chemistry, processing, structure, and property in materials. The goal of the CMD group research is to accelerate the process of materials design and discovery through advancing the science and engineering of materials microstructure. Our research covers a wide range of materials including aerospace materials, energy materials, and biomaterials.



Mechanical Adaptations Laboratory

Director: Dr. Gunes Uzer
Website: https://www.boisestate.edu/coen-mal/

Our research employs biology, physics and engineering to identify the function and regulation of musculoskeletal cells (bone, muscle, cartilage and fat) under mechanical challenges. In our laboratory we apply a variety of mechanical signals to cells which are designed to be comparable analogs for exercise such as mechanical stretching and low intensity vibrations as well as analogs for unloading and microgravity.

Northwest Tissue Mechanics Laboratory

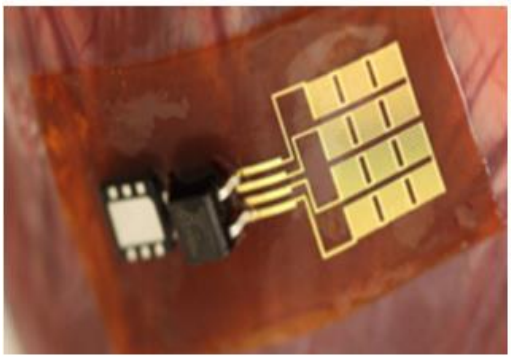
Director: Dr. Trevor Lujan
Website: https://www.boisestate.edu/coen-ntm/

The central mission of the NTM laboratory is to improve the well-being of individuals and societies by addressing persistent problems in musculoskeletal health. A core focus of our laboratory is to investigate how soft tissue responds to force during injury and repair, and to then translate this research into innovative medical solutions that are effective, practical and affordable.

Robot Control Lab

Director: Dr. Aykut Satici
Check out the MBE research page for updates on Dr. Satici's lab.

Dr. Satici's research aims to enable robots to efficiently and robustly perform desired manipulation and locomotion tasks by designing low-level feedback control and estimation algorithms. This avenue of research lies at the intersection of dynamical systems, robotics, controls, and applied mathematics. Tools from analysis, optimization, and differential geometry are integral to the theoretical development of his research, which are complemented with experimental evaluation to assess its practical utility.



Smart Materials and Systems (SMS) Lab

Director: Dr. Zhangxian "Dan" Deng
Check out the MBE research page for updates on Dr. Deng's lab.

The Smart Materials and Systems (SMS) lab is supervised by Dr. Zhangxian "Dan" Deng, who recently joined Boise State University in August 2018. The overall objective of this lab is to investigate the potential of advanced smart materials in structural health or human health monitoring. The on-going projects cover both fundamental research and applied research. The fundamental research includes Multiphysics modeling and experimental characterization of new smart materials.

Thermal Transport and Solar Energy Laboratory

Director: Dr. Todd Otanicar
Check out the MBE research page for updates on Dr. Otanicar's lab.

Research in the Thermal Transport and Solar Energy Lab (TTSEL)is focused on the intersection of thermal and mass transport with a variety of different energy systems. Our research has investigated radiative properties of nanoparticles, erosion in high temperature environments, desalination, and the design of hybrid thermal/photovoltaic solar collectors. Our current focus areas are high temperature solar thermal energy, thermally driven desalination, and enhanced heat transfer.