Hello!

Welcome to Stanford University. We are pleased that you have chosen Stanford for your graduate study. This guide will familiarize you with the department, academic policies, and procedures. In addition to this guide, you are expected to stay informed of policies governing financial aid, degree, and course requirements by consulting university web sites such as the Stanford Bulletin. If uncertain about a policy, please consult with the Student Services Office staff located in building 530, room 125. You may stop by, or give us a call at (650)725-7695. Generally speaking, our office hours are from 9am – Noon, and 1:30pm 5:00pm, Monday through Friday. Office hours are limited during the Admissions Season (Winter Quarter).

Students enrolled in the MS program have been assigned to one or more academic advisors. The assignments were based on availability of the faculty, their research interests and your interests. However, please know that you may seek the advice of any of our faculty throughout the department regardless of who your assigned advisor is. If you wish a formal change of advisor, please let me know.

Brittany Voelker (bvoelker@stanford.edu) and I are available to answer any questions that you may have, academic or otherwise. We know of many on and off campus resources available to you in addition to those listed in this handbook. Please feel free to stop by the office even if just to say hello! My staff and I would appreciate the opportunity to get to know you.

Sincerely,

Indrani Gardella
Student Services Manager
(650) 725-2075
indrani@stanford.edu
MECHANICAL ENGINEERING ADMINISTRATIVE OFFICE
Building 530

The Department of Mechanical Engineering is organized into five groups: Biomechanical Engineering, Design, Flow Physics and Computational Engineering, Mechanics & Computation, and Thermosciences. These groups are housed in separate buildings and have laboratories and centers located throughout the campus. Although each group has its own administrative office and staff, the heart of the department is located in Building 530.

STUDENT SERVICES AND GRADUATE ADMISSIONS OFFICE
Building 530, Room 125 & 126
(650) 725-7695

Indrani Gardella, Student Services Manager (indrani@stanford.edu)
Jennifer Fallin, Degree Progress Administrator (jfallin@stanford.edu)
Brittany Voelker, Graduate Admissions Administrator (bvoelker@stanford.edu)
Professor Sheri Sheppard, Chair of the Committee for Undergraduate Curriculum (Building 550)
Professor Tom Bowman, Chair of the Committee for Graduate Curriculum (Building 520)
Professor Ellen Kuhl, Chair of the Committee for Graduate Admissions (Durand Building)
Professor Thomas Kenny, Chair of the Committee for Faculty Appointments and Promotions (Building 530)

Please come to the Student Services Office with all of your student services questions, issues and concerns. The office processes assistantships and Stanford fellowships, program proposals, leaves of absence petitions, academic petitions, and degree conferral applications and performs many more duties. In addition, we organize various events including orientation and the annual graduation ceremony. It probably is not possible to obtain a degree from the department without visiting this office at least once!

OFFICE OF THE CHAIRMAN
Building 530, Room 113
(650) 723-723-4023

Professor Kenneth Goodson, Department Chairman
Giselle Martin, Department Manager
Hong Clark, Department Administrator
Deborah Sutherland, Faculty Affairs Administrator

The Chairman’s Office handles issues related to faculty, staff and the operating budget. They cannot answer any admission or student services questions or sign academic petitions. However, Professor Goodson is very open to discussing Department or University issues with students, so if you feel that you have a problem or want to bring something to his attention, please feel free to do so.
Biomechanical Engineering (BME) at Stanford embodies teaching and research in which principles of mechanics and design are used to examine fundamental questions in biology and to advance human health. The faculty, research staff, and current and former students are widely known for their leadership in developing new ideas in biotechnology, biomedical design, scientific analysis, and medical applications. Research in BME is both experimental and theoretical, traversing many domains: biodesign, biofluidics, molecular/cell/tissue mechanics, movement biomechanics, biorobotics, mechanobiology, orthopaedic biomechanics, cardiovascular biomechanics, neuroscience, and mechanics of hearing and vision.

Research in Biomechanical Engineering involves multidisciplinary approaches that includes strong interactions with the School of Medicine as well as other engineering disciplines. The BME program has particularly strong research interactions with departments in the School of Medicine, including Orthopaedic Surgery, Surgery, Medicine, Pediatrics, Biochemistry, Structural Biology, and Radiology, the Biodesign Program, and many other programs related to the life sciences.

Facilities
The BME Laboratories include experimental techniques from fundamental biology to clinical studies (including patient studies). The BME laboratories house state-of-the-art wet laboratories with cell and tissue culture, mechanical testing, tissue preparation and a surgical simulation facility. The Computational Biomechanics Laboratory supports graduate research in computer
modeling of the human body. The Biomotion Laboratory supports the development of new methods for motion capture and experimental research on human movement. The Soft Tissue Biomechanics Laboratory supports investigation of tissue mechanics, mechanobiology and tissue engineering. The Neuromuscular Biomechanics Laboratory has extensive imaging facilities, a motion capture laboratory, and computational facilities. The Chaudhuri Lab for Biomechanics and Mechanobiology develops force measurement instruments and engineered biomaterials to investigate mechanical properties of cells and extracellular matrices. The Collaborative Haptics and Robotics in Medicine Lab develops principles and tools needed to realize advanced robotic and human-machine systems capable of haptic interaction for application to biomedical systems. In collaboration with Medical School colleagues, biologically and clinically oriented work is conducted in various facilities throughout the Stanford Medical Center and the VA Palo Alto Health Care System.

DESIGN GROUP
Building 550, Room 114
(650) 725-9131

James Adams, Professor (joint with Management Science & Engineering) (Emeritus)
Banny Banerjee, Associate Professor (Teaching)
David Beach, Professor (Teaching)
William R. Burnett, Consulting Assistant Professor
J. Edward Carryer, Consulting Professor
Mark Cutkosky, Professor
Daniel DeBra, Professor (joint with Aero & Astro) (Emeritus)
J. Christian Gerdes, Associate Professor
Shelley Goldman, Professor (Teaching), by courtesy, and Professor (Teaching) of Education
David Kelley, Professor
Thomas Kenny, Professor and Chair of the Committee for Faculty Appointments and Promotions
Oussama Khatib, Professor, by courtesy, and Professor of Computer Science
Larry Leifer, Professor
David Lentink, Assistant Professor
J. Craig Milroy, Senior Lecturer
Paul Mitiguy, Consulting Professor
Drew Nelson, Professor
R. Matthew Ohline, Consulting Associate Professor
Allison Okamura, Associate Professor
Friedrich Prinz, Professor, (joint with Materials Science and Engineering)
Bernard Roth, Professor
J. Kenneth Salisbury, Professor (Research), by courtesy, and Professor (Research) of Computer Science and of Surgery Sheri Sheppard, Professor and Chair of the Committee for Undergraduate Curriculum
Kenneth Waldron, Professor (Research) (Emeritus)
Douglas Wilde, Professor (Emeritus)

Kristin Burns, Group Manager

The Design Group is devoted to the imaginative application of science, technology, and art to the conception, visualization, creation, analysis and realization of useful devices, products, and objects. Courses and research focus on topics such as kinematics, applied finite elements, microprocessors, medical devices, fatigue and fracture mechanics, dynamics and simulation, micro-electromechanical systems (MEMS), rehabilitation, optimization, high-speed devices,
product design, vehicle dynamics, experimental mechanics, robotics, creativity, idea visualization, computer-aided design, manufacturing, design analysis, and engineering education.

Facilities

The Alex Tung Memorial Assistive Technology Laboratory at Stanford (ATLAS) (Prof. Drew Nelson, Director; David L. Jaffe, MS, Associate Director) provides space and prototyping resources for ENGR110/210 student teams engaged in designing and fabricating devices to benefit individuals with disabilities. It is located in Bldg 550, Rm 134.

The Biorobotics and Dextrous Manipulation Laboratory (Prof. Mark Cutkosky, PI) is affiliated with the Center for Design Research. BDML research activities include: modeling and control of dextrous manipulation with robotic and teleoperated hands; force and tactile feedback in telemaintenance and virtual environments; design and control of compliant "biomimetic" robots with embedded sensors and actuators.

The Center for Automotive Research at Stanford (CARS) (Prof. Chris Gerdes, Director; Sven Beiker, PhD, Executive Director) operates an interdisciplinary automotive research lab, the Volkswagen Automotive Innovation Lab (VAIL). By creating a community of faculty and students from a range of disciplines at Stanford with leading industry researchers, CARS strives to radically re-envision the automobile for unprecedented levels of safety, performance and enjoyment. CARS' mission is to discover, build, and deploy the critical ideas and innovations for the next generation of cars and drivers.

The Center for Design Research (Prof. Larry Leifer, Director) is a community of scholars focused on understanding and augmenting engineering design innovation and design education. We are dedicated to facilitating individual creativity, understanding the team design process, and developing advanced tools and methods that promote superior design and manufacturing of products. We develop concepts and technical solutions for design thinking, concurrent engineering, distributed collaborative design, and design knowledge capture, indexing and re-use. We focus on methods and tools for improving the design of specific engineering systems, with research in structural integrity evaluation and system modeling, virtual design environments, biomimetic robots, haptic controls and telemaintenance, vehicle dynamics and driver assistance systems. CDR is located in Building 560.

The Stanford ChangeLabs (Prof. Banny Banerjee, Director) conducts a growing volume of applied research work with increasing affiliations in the US and around the world. Our focus is on innovation for rapid, large scale transformations to integrate social, environmental, business, and infrastructural concerns. We are developing new trans-disciplinary processes in which Design Thinking combines design methodology, technology strategy, human behavior, and new business processes. The result is new models for organizational innovation as well as leadership models for the future. Our work spans the fields of energy, health, innovation strategies for industry, design theory, design for the developing world, and innovative policy design.

The Collaborative Haptics and Robotics in Medicine Lab (CHARM Lab) (Prof. Allison Okamura, PI) develops principles and tools needed to realize advanced robotic and human-machine systems capable of haptic (touch) interaction. Systems for teleoperation, virtual environments, and robotic manipulation are designed and studied using both analytical and experimental approaches. Application areas include surgery, simulation and training, rehabilitation, prosthetics, neuromechanics, exploration of hazardous and remote environments, design, and education. The lab is located in the Mechanical Engineering Research Laboratory (MERL, Building 660), Room 129.
The **Design Observatory (DO)** (Prof. Larry Leifer, PI) is a research environment for studying engineering design activity by observing it, analyzing it and intervening into it. Engineering designers either individually or in teams can perform a variety of design activities like idea generation, prototyping, and design meetings in the DO. Through observation, videotape and analysis, the researchers discover patterns of behavior that are correlated to effective design performance. The DO environment is flexible enough to allow researchers to set up different design experiments quickly and easily. It also allows researchers to investigate various aspects of design behavior in a detailed manner. The end results of the research carried out in the DO are new metrics of effective design behaviors, new research methods and new design behaviors or practices. The DO is located in the Center for Design Research, Building 560.

Chris Gerdes is Director of the Center for Automotive Research at Stanford (CARS) and directs his own laboratory, the **Dynamic Design Lab (DDL)**. Research interests in the DDL include vehicle dynamics, design of x-by-wire systems, driver assistance systems and control of homogeneous charge compression ignition engines. A good example is the current development of autonomous racing and drifting algorithms to enable Shelley, an Audi TT-S, to race up Pikes Peak without a driver.

The **Experimental Mechanics Lab** (Prof. Drew Nelson, PI), located in the Mechanical Engineering Research Lab (MERL, Bldg 660), provides rotating bending and combined torsion-bending fatigue testing machines, a digital speckle pattern interferometry set-up, and residual stress measurement instruments.

The **Loft** (located in Building 610) is a unique facility that represents the culture of innovation at Stanford. It is a space in which students of the Stanford Design Program (Prof. David Kelley, Program Director) carry out graduate level design work. The **ME310 Design Team Development Loft** (Prof. Larry Leifer, PI) provides space and technical support for globally distributed product development teams working on corporate partner projects. Teams are assigned a desktop design station with internet video studio support. The facility is located in Building 550.

The **Microscale Engineering Laboratory** is located in the Mechanical Engineering Research Laboratory (MERL, Building 660), and is shared by Professors Goodson, Kenny and Santiago, of the Thermosciences and Design Groups. This lab features facilities for thermal, mechanical, and fluid measurements with a unifying emphasis on microscale aspects. In addition to the individual research activities of these faculty members, there are also several shared PhD projects, involving a mixture of thermal, mechanical and fluids issues in single projects.

The focus of the **Nanoscale Prototyping Laboratory** (Prof. Fritz Prinz, PI) is on the design and fabrication of micro and nanoscale devices for energy and biology. Examples include fuel cells and bioreactors. Interest is in mass transport phenomena across thin membranes such as oxide films and lipid bi-layers. This research group studies electro-chemical phenomena with the help of Atomic Force Microscopy, Impedance Spectroscopy and Quantum Modeling. The facility is located in Building 530.

The **Product Realization Laboratory** (PRL) (Prof. David Beach & Craig Milroy, Co-Directors) offers design-oriented prototype creation facilities to students engaged in course work or research. Design reaches fruition in the testing of hardware. The creation of physical artifacts often leads to design solutions that would otherwise not occur. Hands-on experience engenders tacit knowledge regarding devices, materials and processes. Relationships between design and manufacturing are clarified through prototype creation. The PRL is located in Building 610. Room 36, a new PRL facility focused on highly-accessible early stage prototyping, is located in...
the Huang Engineering Center.

The **Smart Product Design Lab** (Prof. Ed Carryer, Director) supports microprocessor application projects related to ME218abcd and is located in the Thornton Center.

The **Stanford Micro-Structures & Sensors Lab** (Prof. Tom Kenny, PI) is the setting for efforts to develop and fabricate novel mechanical structures. Basic research on the non-classical phenomena exhibited by micro structures is emphasized as well.

**FLOW PHYSICS and COMPUTATIONAL ENGINEERING GROUP**  
**Building 500, Room 500B**  
*(650) 736-0766*

*Peter Bradshaw, Professor (Emeritus)*  
*Eric Darve, Associate Professor*  
*John Eaton, Professor*  
*Margot G. Gerritsen, Associate Professor, by courtesy, and Associate Professor of Energy Resources Engineering*  

*Gianluca Iaccarino, Associate Professor*  
*Matthias Ihme, Assistant Professor*  

*Vadim Khayms, Senior Lecturer*  
*David Lentink, Assistant Professor*  
*Sanjiva Lele, Professor (joint with Aero & Astro)*  
*Ali Mani, Assistant Professor*  
*Parviz Moin, Professor, Group Chair and Director of Center for Turbulence Research*  

*Rika Bosmans, Group Manager*

[http://fpc.stanford.edu](http://fpc.stanford.edu)  
[http://ctr.stanford.edu](http://ctr.stanford.edu)  
[http://psaap.stanford.edu](http://psaap.stanford.edu)  
[http://exascale.stanford.edu](http://exascale.stanford.edu)

Fluid mechanics is an important part of engineering. Many devices and systems involve liquids and gases or are manufactured or recycled using fluid processes. Fluid mechanics plays a major role in such diverse areas as blood flow in our bodies, flow over aircraft wings, injection, mixing, and combustion of fuel and oxidizer in the combustor of propulsion engines, noise-emission from aircraft, dispersion of pollutants in the atmosphere, solar energy harvesting systems, and plasma processing in semi-conductor equipment manufacturing.

With the rapid development in computer technology, the future offers great opportunities for computational engineering analysis and design. The Flow Physics and Computational Engineering Group (FPCE) blends research on flow physics and modeling with algorithm development, scientific computing, and numerical database construction. FPCE is contributing new theories, models and computational tools for accurate engineering design analysis and control of complex flows (including multiphase flows, chemical reactions, acoustics, plasmas, interactions with electromagnetic waves and other phenomena) in aerodynamics, energy production, propulsion and power systems, materials processing, electronics cooling, environmental engineering, and other areas. A significant emphasis of research is on modeling and analysis of physical phenomena in engineering systems. In addition, FPCE students and
research staff are developing new methods and tools for generation, access, display, interpretation, and post-processing of large databases resulting from numerical simulations of physical systems. Research in FPCE ranges from the development of advanced numerical algorithms for simulation of turbulent flows to active flow and combustion control using control theory for distributed systems. The FPCE faculty teaches graduate and undergraduate courses in engineering, computational mathematics, fluid mechanics, turbulence, heat transfer, solid mechanics, thermodynamics and propulsion, combustion, acoustics, aerodynamics and computational fluid mechanics.

The Flow Physics and Computational Engineering Group is strongly allied with the Center for Turbulence Research (CTR), a research consortium between Stanford and NASA, the Predictive Science Academic Alliance Program (PSAAP), one of the U.S. Department of Energy centers of excellence in computational science, and the Institute for Computational and Mathematical Engineering (ICME). CTR conducts fundamental research aimed at understanding the mechanics of turbulent flows leading to prediction methods and algorithms for turbulence control. PSAAP research thrust is the development of computational algorithms and physical models to study the interaction between air turbulence, particle transport and radiation as it occurs in solar-thermal energy devices. The program is built over a strong collaboration between FPCE and the Computer Science department at Stanford to harness the power of next-generation exascale computers in simulating complex multiphysics problems at an unprecedented fidelity. The FPCE Group has direct access to major national computing facilities located at the various DOE and facilities NASA, including massively parallel super computers and hybrid multiprocessor GPU/CPU systems. The intellectual atmosphere of the Flow Physics and Computational Engineering Group is greatly enhanced by interactions with CTR and PSAAP staff of postdoctoral researchers and distinguished visiting scientists. Group facilities include several parallel supercomputers (with up to 7000 CPUs), advanced workstations and reproduction facilities and experimental and flow and heat transfer measurement facilities.

Students interested in doctoral research with FPCE faculty are advised to arrange for directed study (ME391/392) with one or more of the affiliated faculty during their master’s year.

MECHANICS AND COMPUTATION GROUP
Durand Building, Room 223
(650) 723 4133

Thomas P. Andriacchi, Professor (joint with Orthopaedic Surgery)
David Barnett, Professor (joint with Materials Science and Engineering)
Wei Cai, Associate Professor
Fu-Kuo Chang, Professor, by courtesy, and Professor of Aero & Astro

Eric Darve, Associate Professor
Reinhold Dauskardt, Professor, by courtesy, and Professor of Materials Science and Engineering

Charbel Farhat, Professor (joint with Aero/Astro)
Ellen Kuhl, Associate Professor and Chair of the Committee for Graduate Admissions
Adrian Lew, Associate Professor
Ali Mani, Assistant Professor
Peter Pinsky, Professor and Group Chair
Beth Pruitt, Associate Professor
Sunil Puria, Consulting Associate Professor
Charles Steele, Professor (Emeritus)
Teaching and research in the Mechanics and Computation Group is devoted to the study of a broad range of mechanical phenomena including the behavior of solids, fluids, biological tissue and complex materials under the actions of loads. The ultimate goals of this effort are to discover new scientific knowledge relevant to engineering problems of the future, to enhance technological development in a broad range of industries, to improve health in society and to advance national security and defense.

Much of the research conducted within the Group is interdisciplinary in nature, reflecting a combination of concepts, methods, and principles that often span several areas of mechanics, mathematics, computer sciences, materials science, biology and numerous other scientific disciplines. Our approach often combines experimental or clinical studies with theoretical modeling and numerical simulation to create tools that both explain phenomena and predict behavior and that may be used to advance concepts and designs in industry.

To achieve our educational objectives our teaching and research encompasses computational mechanics, multiphysics modeling, computational bioengineering, and micro-scale devices.

**Computational mechanics** is concerned with the development and application of computational methods based on the principles of mechanics and the field has had a profound impact on science and technology over the past three decades. It has effectively transformed much of classical Newtonian theory into practical and powerful tools for prediction and understanding of complex systems and for creating optimal designs. Active research topics within our Group include development of new finite element methods (e.g. discontinuous Galerkin method), computational acoustics and fluid-structure interaction, algorithms for dynamical and transient transport phenomena, adaptive solution schemes using configurational forces, modeling the behavior of complex materials and biological tissue. The group is actively engaged in methods and algorithm development for high-performance computing including massively parallel computing. A recent emphasis is concerned with the coupling of techniques for analysis at the quantum, atomistic and continuum levels to achieve multi-scale modeling.

**Multiphysics modeling** arises from the need to model complex mechanical, physical and/or biological systems with functionalities dependent on interactions among chemical, mechanical and/or electronic phenomena. These systems are often characterized by wide ranges in time and length scales which requires the development of technologies to describe and model, using numerical and mathematical techniques, the coupling between those scales with the goal of designing and/or optimizing new engineering devices. Myriad different applications exist ranging from novel molecular scale devices based on nanotubes and proteins, to sensors and motors that operate under principles unique to the nanoscale. Computer simulation is playing an increasingly important role in nano-science research to identify the fundamental atomistic mechanisms that control the unique properties of nano-scale systems.

**Computational bioengineering** is a quickly advancing field of research and is providing opportunities for major discoveries of both fundamental and technological importance in the coming years. The interface between biology and computational engineering will be one of the most fruitful research areas as the ongoing transformation of biology to a quantitative discipline promises an exciting phase of the biological revolution in which engineers, and especially those employing computation, will play a central role. As physical models improve and greater computational power becomes available, simulation of complex biological processes, such as the biochemical signaling behavior of healthy and diseased cells, will become increasingly tractable. A particular challenge along these lines lies in the multiscale modeling of biomechanical phenomena bridging the gap between the discrete cell level and the continuous tissue level. The
potential scientific and technological impact of computational bioengineering can hardly be overstated. The group is playing an active part in this research effort at Stanford with current collaborative projects with the School of Medicine in areas such as the modeling of the mechanics of the ear and hearing, the eye and vision, growth and remodeling, simulation of proteins and mechanically gated ion channels, tissue engineering and stem cell differentiation.

Micro-scale devices are micro-machined sensors for system monitoring and modeling and are also used for measuring nanoscale mechanical behavior. In the Mechanics and Computation Group we have a special interest in the biomedical applications of nanofabricated devices with the goal of developing diagnostic tools, measurement and analysis systems, and reliable manufacture methods. Active projects include piezoresistive MEMS underwater shear stress sensor, piezoresistive processing, cell stimulation and force measurements, understanding the biological sense of touch, and coaxial tip piezoresistive probes for scanning gate microscopy.

To deal with such complex and often multidisciplinary problems, the engineer must have a thorough knowledge of analytical, computational, and experimental methods and a deep understanding of underlying physical principles. To achieve this level of understanding, graduate curricula in Mechanics and Computation are offered which include core work in solids, fluids and computational mechanics, dynamics, fracture and biomechanics. Course work is supplemented with research in the student’s specialized area of interest.

The Mechanics and Computation Group is located in the William F. Durand Building. The building provides offices, computer facilities, research laboratories, and seminar rooms for faculty, research associates, and graduate students of the Group. MS candidates planning to proceed to a Ph.D. program are encouraged to consider arranging three or more units of directed study (ME391/392) during their MS program.

THERMOSCIENCES GROUP
Buildings 520, 530, 570 and MERL
Group Office, Building 520-Room 520F
(650) 725-2012

Tom Bowman, Professor and Chair of the Committee for Graduate Curriculum

Mark Cappelli, Professor and Thermosciences Group Chair
Chris Edwards, Professor
David Golden, Consulting Professor
Kenneth Goodson, Professor and Department Chair
Ronald Hanson, Professor
James Johnston, Professor (Emeritus)
William Kays, Professor (Emeritus)
Charles Kruger, Professor (Emeritus)
Arun Majumdar, Professor
Reginald Mitchell, Professor
Robert Moffat, Professor (Emeritus)
M. Godfrey Mungal, Professor (Emeritus)
J. David Powell, Professor (joint with Aero & Astro) (Emeritus)
Juan Santiago, Professor
Sindy Tang, Assistant Professor
Hai Wang, Professor
The Thermosciences Group conducts experimental and analytical research on both fundamental and applied topics in the general area of thermal and fluid systems. Research strengths include high Reynolds number flows, microfluidics, combustion and reacting flows, multiphase flow and combustion, plasma sciences, gas physics and chemistry, laser diagnostics, microscale heat transfer, convective heat transfer, and energy systems. Research motivation comes from applications including air-breathing and space propulsion, bioanalytical systems, pollution control, electronics fabrication and cooling, stationary and mobile energy systems, biomedical systems, and materials processing. Emphasis is on fundamental experiments leading towards advances in modeling, optimization, and control of complex systems.

Facilities

The Thermosciences Group has three major laboratory facilities. The High Temperature Gasdynamics Laboratory includes research on sensors, plasma sciences, coal and biomass combustion and gasification, fuel conversion kinetics, pollutant formation during combustion, and reactive and non-reactive gas dynamics. Research facilities include diagnostic devices for combustion gases, a spray combustion facility, laboratory combustors including a coal combustion facility, a supercritical water combustion and gasification facility, supersonic combustion facilities, several advanced laser systems, a variety of plasma facilities, a pulsed detonation facility, and four shock tubes and tunnels.

The Thermosciences Group and the Design Group share the Microscale Thermal and Mechanical Characterization laboratory (MTMC). MTMC is dedicated to the measurement of thermal and mechanical properties in thin-film systems, including microfabricated sensors and actuators and integrated circuits, and features a nanosecond scanning laser thermometry facility, a laser interferometer, a near-field optical microscope, and an atomic force microscope. The activities at MTMC are closely linked to those at the Heat Transfer Teaching Laboratory (HTTL), where undergraduate and master’s students use high-resolution probe stations to study thermal phenomena in integrated circuits and thermally-actuated microvalves. HTTL also provides macroscopic experiments in convection and radiative exchange.

The Energy Systems Laboratory is a teaching and research facility dedicated to the study of energy conversion systems. The lab includes three dynamometers for engine testing, a computer-controlled variable engine valve controller, a fuel-cell experimental station, a small rocket testing facility, and a small jet engine thrust stand.

The Guidance and Control Laboratory, a joint activity of the Department of Aeronautics and Astronautics and the Department of Mechanical Engineering, specializes in construction of electromechanical systems and instrumentation, particularly where high precision is a factor. Work ranges from robotics for manufacturing to feedback control of fuel injection systems for automotive emission control. The faculty and staff work in close cooperation with both the Design and Thermosciences Groups on device development projects of mutual interest.
Enrollment

To retain your student status, you must be enrolled full time (8-10 units) during Autumn, Winter and Spring Quarters. Exceptions to this rule:

- Honors Coop (SCPD students) are part time
- In the final quarter of your degree program, if your requirements will be fulfilled by taking less than 8 units, you may petition to take 3-7 units via the registrar’s office
- TGR students must enroll in the 0 unit TGR course*
- Students in “Graduation Quarter” (final quarter) must also enroll in the 0 unit TGR (PhD) or SPEC (MS) course
- Students with documented disabilities through the Office of Accessible Education may petition to take less than 8 units via the registrar’s office

Although Summer Quarter enrollment is optional for most, if you are working as a summer TA, CA or RA, or you are receiving a fellowship during summer, you must enroll in the appropriate number of units according to your specific assistantship or fellowship.

Enrollment is completed via Axess and must be done by the first day of each quarter. The registration (study list) deadlines are published in the University Academic Calendar. Failure to register on time will cost you a late fee of at least $200, assessed by the registrar’s office. If International students miss the enrollment deadline, the Department of Homeland Security may get involved.

Follow the on-line directions in Axess to register. If a course allows you to choose a grading option (letter grade or S/NC), be sure to elect the correct grading type required for your degree requirements. See the section on degree requirements for more details. There is a quarterly deadline to change the grading option. Once this deadline has passed, you will not be able to change it. Please read the policy on grading option carefully so you do not enroll in the wrong option for a given course.

* TGR is a special status that Ph.D. students may attain once they have completed all their formal course work. While enrolled as a TGR student, you may take up to three units in addition to the TGR course without increasing your tuition bill. By definition, TGR students have completed all course requirements, so any courses taken during TGR status must not be necessary for degree conferral. For example, taking 1 course per quarter to complete a PhD Minor while on TGR status is not allowed. Many students take advantage of this opportunity to take “fun” classes like athletics or art.
Units

Graduate students in the School of Engineering must enroll for a minimum of 8 units per quarter (except in Summer Quarter) with some exceptions listed above. A typical academic load for students is 9-10 units, although students who are not restricted by a fellowship or assistantship may choose to do 11-18 units. Students who seek exception to the 8 unit minimum policy must meet one of the following criteria to enroll for a minimum of 3 units:

- You will finish all degree requirements and complete the program during the quarter for which 3-7 units is requested and you will not be enrolled the following quarter. Request for Tuition Adjustment must be approved by the Student Services Office and the Registrar.

- You have received approval from the Disability Resource Center for special accommodation. Request for Tuition Adjustment must be approved by the Student Services Office and the Registrar.

- You are a Ph.D. or ENG student and have completed all requirements except for the oral defense and dissertation, or thesis. You must enroll in the 0 unit TGR course. Petition for Terminal Graduate Registration (TGR) status must be approved by the Student Services Office and the Registrar.

All degree requirements have already been completed. Since students must be enrolled during the quarter of degree conferral, you may petition for a one-time $100 tuition quarter for the purpose of graduating. In this case, you must enroll in the 0 unit TGR course (or SPEC course for MS students). Petition for Graduation Quarter must be approved by the Student Services Office and the Registrar. Important note: If a Ph.D. student takes a graduation quarter but does not complete the degree requirements during that quarter, the tuition rate will revert back to full tuition rate for the following quarter. A new TGR petition must be filed to regain TGR status.

All petitions can be downloaded from the University Registrar’s Office Graduate Forms page.
<table>
<thead>
<tr>
<th>Units</th>
<th>Cost Per Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-18*</td>
<td>$15,160</td>
</tr>
<tr>
<td>8-10</td>
<td>$ 9,850</td>
</tr>
<tr>
<td>TGR**</td>
<td>$ 2,775</td>
</tr>
</tbody>
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*Tuition continues to increase by the per unit rate for each unit taken above 18

**TGR: Applicable only to post-MS students who have completed all University and Department requirements except for oral exam and dissertation submission. Enrollment in TGR is required to complete the dissertation. In special cases, MS students may attain TGR status if there is a project or thesis required for degree conferral (this is rare).

Fall Quarter Preliminary Study List Deadline (September 23): Failure to enroll in at least 8 units (or the TGR course if applicable) by this date will result in at least a $200 late charge.

Fall Quarter Final Study List Deadline (October 11): Last day to add, drop or adjust units.

Withdraw: You may withdraw from a course after the Final Study List Deadline until November 15. A notation “W” will be recorded on your transcript for that course. Students who do not officially withdraw from a class by the end of the eighth week will be assigned a grade by the instructor. **“W” grades cannot be changed by retaking the course.**

Incomplete: If you would like to take an incomplete or “I” for a course, you must make arrangements with the instructor by the last day of class. All coursework must be completed, and the incomplete must be changed to a credit or grade within one academic year. Failure to do so will automatically result in a failed grade that cannot be changed under any circumstances.

Course Retakes: Generally speaking, completed courses may be retaken one time. When retaking a course, you must register for the same number of units as when you originally took the course. The units for the first attempt will change to zero, and the grade or notation will change to “RP”. The grade for the second attempt will include an indication that it is a repeated course. You may only retake a course for a third time if an “NC” (no credit) or an “NP” (not passed) was received for the second attempt.
University Unit Requirement

Each type of degree has a specific total unit requirement, set by the University (please see the Stanford Bulletin for details). This should not be confused with department degree unit requirements, which may differ. Students in doctoral programs are eligible for the TGR tuition rate when they have completed the unit requirement as well as all other requirements established by the University and the Department.

Students Completing More than One Graduate Degree Program

If you are pursuing more than one graduate degree, you may not double-count units towards the different degrees. The major exception to the policy is that the 45 units required for the Master’s degree are included in the 135 units required for the doctoral degree. It is also possible for a student who did an MS degree at another university to transfer up to 45 units towards their Ph.D. degree.

Unit Requirement Chart

Note: In addition to meeting University requirements, students must also meet department unit degree requirements (see degree section).

<table>
<thead>
<tr>
<th>Degree Requirement</th>
<th>Units</th>
<th>Maximum Transfer</th>
<th>TGR Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>45</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>Engineer</td>
<td>90</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td>Doctorate</td>
<td>135</td>
<td>45</td>
<td>135</td>
</tr>
</tbody>
</table>

To Change or Add a Degree Program

To change or add a degree program, you must complete the Graduate Authorization Petition process. The Graduate Authorization Petition is on-line, via Axess. MS students interested in staying for a PhD must complete a paper petition BEFORE submitting the on-line petition. Be sure to complete this petition process before conferring your MS degree. Failure to do so will force you to apply for the Ph.D. program as an outside applicant. Submitting the on-line petition will incur a fee regardless of the outcome, so please be certain of your intentions before completing the on-line form. The petition should be used in the following situations:

1. A matriculated MS-ME student who would like to continue with a Ph.D. must submit the departmental form to the Student Services Office by the beginning of the final MS quarter. The student must secure funding and advising for the Ph.D program through a faculty sponsored assistantship (or have proof of fellowship support), and have the faculty member sign the form. If the faculty member is from a department other than Mechanical Engineering, you must secure a co-advisor in Mechanical Engineering before the petition will be approved. In order to add the PhD, the student must have a minimum 3.5 GPA, and be able to prove at least 4 quarters of funding through faculty support or fellowship. Faculty who sign the petition are committing to support and advising for the duration of the PhD program. After the form is filed with the Student Services Office, the student must submit the on-line petition via Axess. If the MS degree is conferred prior to the addition of the Ph.D. degree, the student will be required to apply for the Ph.D. program as an “external” applicant and adhere to application deadlines, pay application fees, etc.
2. A matriculated graduate student changing departments (on-line petition only), please talk to the Admissions and Financial Aid Specialist before submitting the online petition because the fee will apply whether the transfer is successful or not.

3. A matriculated graduate student in the ME Department changing fields (e.g., MS in Biomechanical Engineering). No funding forms required.

Note: International students are required to submit proof of adequate financial support prior to obtaining departmental approval. Contact the Bechtel International Center for details.

Academic Progress Requirement

Graduate students enrolling at full tuition (11-18 units per quarter) must enroll for at least 11 units per quarter and pass at least 8 units each quarter; those registering at 8-10 units per quarter must enroll for at least 8 units per quarter and pass at least 6 units per quarter.

Leave of Absence for Graduate Students

Graduate students may find themselves in need of a Leave of Absence. Common reasons for interrupting school temporarily are family emergencies, illness, financial difficulties, or even employment or internship opportunities that could further progress in research.

Procedure to File a Leave of Absence: A leave of absence must be approved in advance by the student’s advisor and the department. Although there is no signature line for the graduate student’s advisor, an irrelevant signature line (i.e. a line for undergraduate students) can be used for this purpose. Evidence of good academic progress is a requirement to obtain approval. The leave form must be approved by the Student Services Manager and submitted to the Registrar’s Office for final approval and processing. International students must also obtain approval from the Bechtel Center to ensure visa requirements are met. Failure to enroll without first obtaining approval for a Leave of Absence will cause discontinuation of your student status.

Once a leave of absence is granted, the right to use University facilities (i.e. libraries, athletic facilities, etc.) is halted as student status will not be active during the leave. This also applies to any Stanford funding (e.g., fellowships, assistantships and loans). Therefore, a student is advised to think carefully before requesting a leave. Should one be necessary, please consult with the Student Services Manager.
FINANCIAL AID

What is an Assistantship: Assistantships are contracts for students to do research or teach in exchange for salary and tuition.

Research Assistant: A matriculated and registered graduate student who participates in a research project under the supervision of a faculty member. For the most part, research assistants are selected by individual faculty with available research funding. Continuation of a research assistantship depends on the quality of the work performed and the availability of research funds. An assistantship that spans multiple years requires a new RA form at the beginning of each year.

Teaching Assistant: A matriculated and registered graduate student who assists a faculty member to teach his or her course. Duties vary and may include: preparing for class sections and/or labs, grading exams or papers and holding regular office hours. Teaching assistants are not expected to independently assign final grades.

Course Assistant: A matriculated and registered graduate student who assists a faculty member to teach his or her course. Duties vary and may include assisting to prepare lecture materials, conducting review sessions, holding office hours and grading exams. Course Assistants have less independence than Teaching Assistants.*

*Teaching Assistants and Course Assistants are now required to fulfill the Mechanical Engineering CA/TA training program.

POLICIES: STUDENTS WITH TEACHING/COURSE/RESEARCH ASSISTANTSHIPS

Note: All individuals who serve as Course or Teaching Assistants for courses offered by Mechanical Engineering must participate in the TA Orientation program offered by the Center for Teaching and Learning, as well as the department specific training. Sessions are given each quarter throughout the year. More information can be found on the CTL website:

Enrollment: All students holding assistantships must be enrolled for courses (minimum 8 units) during the quarter for which the assistantship appointment is held (including Summer Quarter). Although summer enrollment is optional for students who are not holding assistantships, it is mandatory for research, teaching and course assistants. Students holding 50% assistantships are prohibited from taking more than 10 units.

Tuition: The tuition grant that is part of the compensation package can be used only for tuition charges. It is not transferable for cash, cannot be used by another student, and cannot be used for other charges, such as ASSU fees or health insurance. The tuition credit will appear on the student bill after the student has enrolled for a minimum of 8 units, or 3-7 units if a petition has been approved for a disability or final quarter registration. Students with approved TGR status must enroll for the TGR course. Students who have been approved for Graduation Quarter must enroll in the TGR course (PhD) or the SPEC course (MS).

Tuition payment: The amount of tuition paid is based on the total percentage of time employed in any given quarter, as shown below. The student must be appointed for the entire quarter or the tuition charges will be billed back to the student. Engineer and Ph.D. students who are eligible for TGR will receive only the TGR tuition rate regardless of the percentage of the appointment. Students in their final quarter with an approved “reduced tuition” rate will only receive a tuition grant for the number of units taken. Students in their “graduation quarter” will receive tuition in the amount of $100.
Important note: If a Ph.D. student takes a graduation quarter but does not complete the degree requirements during that quarter, the tuition rate will revert back to full tuition rate for the following quarter. A new TGR petition must be filed to gain TGR status again.

Use of all credit – With the exception of TGR status students, students on assistantships must enroll for a minimum of 8 units (with some exceptions, listed above). Students with half-time assistantships (50% time or 20 hours per week) are entitled to receive tuition credit for 8-10 units per quarter. Students with 25% assistantships (10 hours per week) receive 5 units of tuition credit and are required to pay the remaining tuition due.

Students with 50% appointments are typically expected to work a maximum of 20 hours per week in addition to carrying an 8-10 unit load per quarter. Students with 25% appointments work 10 hours per week in addition to carrying a unit load of 8-10 or more quarter. An academic quarter lasts 12 working weeks, including the exam week. Some assignments will require the assistant to start one week before the quarter begins.

The assistantship salary and tuition credit begins and ends each quarter as follows:

**Autumn Quarter**: October 1 - December 31 (first pay check available 10/22 and last check 1/7)
**Winter Quarter**: January 1 - March 31 (first pay check available 1/22 and last check 4/7)
**Spring Quarter**: April 1 - June 30 (first pay check available 4/22 and last check 7/7)
**Summer Quarter**: July 1 – September 30 (first pay check available 7/22 and last check 10/7)

The check cut on the 22nd of the month covers work completed from the 1st through the 15th. The check cut on the 7th of the month covers work completed from the 16th through the 31st of the prior month. For example, if you start working on October 1st, your first paycheck on October 22 will cover your pay period October 1 - 15. Your second paycheck, for the pay period October 16 – 31, will be cut on November 7th. These are the formal periods used for delivery of salary payments. Students who are required to start work before the quarter begins receive no extra allowance, but the research or teaching supervisor should adjust the schedule so it does not exceed the norm. We highly recommend setting up direct deposit to avoid lost checks in the U.S. mail.

Assistantship appointments are for a full quarter; there are no partial quarter assistantships available. Students on assistantships who leave the University for any reason must contact the Student Services Office to ensure that the appointment is canceled. In this case, if an assistantship is not canceled and payment continues, the student will be responsible for repayment of salary, **plus any fees incurred**. If you know in advance that you will not be able to work for the whole quarter, you may be able to work as an hourly employee instead. However, tuition benefits are not part of hourly employment agreements.

**Summer Quarter RA appointments**: During Summer Quarter, it may be possible for you to work more than 50% time if your research supervisor has adequate funding and allows for it. It is quite common for RA appointments to be increased to 75% or even 90% time. A 90% appointment is the maximum allowable for enrolled students. Please note that you must enroll if you are going to work as an assistant during Summer Quarter. Failure to enroll will result in payments being withheld. During Summer Quarter, the tuition benefit is in reverse proportion to the number of hours worked. For example, 50% appointments pay for 8-10 units, but 75% appointments pay for only 5 units and 90% appointments pay for 3 units. You should enroll in the correct number of units according to how much your tuition grant will be. If you decide that you do not want to enroll during Summer Quarter, you may ask your research supervisor about the option to work hourly. If you enroll in the wrong number of units, you may receive a tuition bill
for anything your assistantship does not cover. You will have to contact the Student Services Center on the 2nd Floor of Tresidder Union should this occur.

NOTE: TGR students must enroll in the TGR course. TGR students who are Research Assistants may take up to three units in addition to the TGR course and the tuition will be paid. However, if you take more than 3 units during a TGR quarter, you will be responsible for paying any extra tuition. (This applies to all TGR quarters, not just Summer Quarter.) Please note that you may not take courses necessary for a degree requirement (including a PhD minor) while on TGR status.

Work in Addition to an Appointment or Stanford Fellowship: Employment in addition to a 50% assistantship or full fellowship must be formally approved by the faculty supervisor and **cannot exceed 8 hours per week**. This policy is monitored very closely by the School of Engineering Student Affairs Office. Students on the Graduate Engineering Fellowship, Stanford Graduate Fellowship and NSF should consult the ME Student Services Office prior to accepting employment. Immigration regulations prohibit International students on F and J visas to work in addition to a 50% assistantship while enrolled full time. International students must be aware of visa restrictions. Information on visas should be obtained from the Bechtel International Center.

Benefits: Students on assistantships do not accrue sick leave or vacation. Time off is subject to the approval of the faculty supervisor and must be requested well in advance.

Health Subsidy: Students who have RA/TA/CA appointments of at least 25% time for any given quarter are eligible for the university health subsidy, which will pay one half of the Cardinal Care health premium, should you choose to enroll in Cardinal Care. You are responsible for paying the other half. In order to receive the subsidy, your appointment must be fully approved by the supervisor, all paperwork must be signed and submitted on time, and you must be enrolled in courses by the Study List Deadline. If you fail to meet any of these requirements during any given quarter, you will forfeit your health subsidy for that quarter.

Fellowships: Stanford fellowships and outside fellowships that are processed by Stanford are paid on a quarterly basis. The tuition (if applicable) is credited to the student’s account directly and the Student Financial Services office will deduct fees such as health insurance from the stipend. The remainder will be deposited directly to your bank account if you have requested direct deposit, or mailed to your mailing address. We highly recommend direct deposit for the most convenient and timely receipt of stipend payments. If you receive a fellowship that is paid directly to you, please contact the Admissions and Financial Aid Specialist, and include documentation detailing the funding package. You must provide this information prior to the start of each academic year that you hold the outside fellowship.

Note: If you are appointed to an assistantship when your fellowship ends, keep in mind that there will be a two week delay before your first assistantship paycheck is issued. You also must file employment paperwork at the onset of your assistantship. Please stop by the Student Services Office for more information.

Health Subsidy: Students who receive a non-tuition stipend at or above the minimum salary for a 25% assistantship (CA or RA) for any given quarter are eligible for the university health subsidy, which will pay one half of the Cardinal Care health premium. You are responsible for paying the other half. In order to receive the subsidy, your fellowship must be fully approved on time, and you must be enrolled in courses by the Study List Deadline. If you fail to meet any of these requirements during any given quarter, you will forfeit your health subsidy for that quarter. If you receive an outside (non-Stanford) fellowship that pays you directly, you **may** be eligible for the health subsidy if the student services office receives official details (copy of the award letter).
by the health subsidy deadline. The amount of the external fellowship dictates whether the health subsidy will be paid or not. Please contact the Admissions and Financial Aid specialist for more information. Questions about health insurance coverage and payments of premiums should be directed to Vaden Health Center.

HOW TO OBTAIN PAYMENT

Responsibility of Processing Payment: Students paid by mechanical engineering accounts must ensure that all necessary documentation is completed and submitted appropriately. Delays will not only delay payment, but may result in the loss of the University’s student health subsidy. It is strongly advised that students be proactive to make sure that the assistantship is processed well in advance of the anticipated start date. Students who need help should contact the Mechanical Engineering Student Services Office and/or their group administrator.

Social Security Number: Students receiving research or teaching assistantships must obtain a social security number. International students on Stanford based fellowships are to obtain an Individual Tax Identification Number (ITIN) from the Bechtel International Student Center in order to receive their fellowship funds.

International students who do not have a social security number must apply for one through the Social Security Administration Office. As national security concerns have increased over the last few years, federal regulations evolve rapidly. In order to ensure that you have the most updated information on how to apply for and obtain a social security card, please see the Bechtel International Student Center website.

Note: In a response to “national security and fraud concerns,” the Social Security Administration has implemented policy that requires verification of certain information in an Immigration and Naturalization Services (INS) database. The Social Security Administration strongly suggests that a student wait 10-12 days after arriving to the United States before applying for the Social Security Number. This will allow adequate time for information verification.

The closest Social Security Administration office is located at:

700 East El Camino, Suite 350, Mountain View, CA 94040
Office Hours: M-F 9:00 am to 4:30 pm
Phone: 1-800-772-1213

Note: You must apply in person.

Once you have applied for the social security number, bring your receipt to the ME Student Services Office. We can use a copy of the receipt for payroll purposes, but you must provide a copy of your social security card once you receive it.

Taxes and Tax Reporting:

a) The tuition portion of fellowships and assistantships is exempt from tax.
b) All stipends and salaries are subject to tax. The amount of tax varies according to total income, dependency status, treaty status for International students, and individual circumstances.
c) Assistantship salaries are subject to tax withholding.
d) Fellowship stipends paid to U.S. citizens and permanent resident are not subject to withholding, but are still taxable income. Students may be responsible for making estimate tax payments during the year, if appropriate.
e) Fellowship stipends paid to non-US citizens or permanent residents are subject to 14% tax withholding.

The Student Services Office is unable provide advice or assistance with taxes. Students are encouraged to seek the advice of tax consultants or accountants. You may also find helpful information on the Student Financial Services website:

**Eligibility to Work Requirement**: Per federal regulations, individuals who are paid on the Stanford payroll (assistantships, hourly appointments, etc.) must have an I-9 (identification and work eligibility form) on file prior to commencement of employment. The I-9 form requires the individual to provide appropriate documentation to prove eligibility for work (social security card, birth certificate, current driver’s license). Students on visas must show a current passport and the current visa. The I-9 must be renewed when the visa is extended. Expired visas will cause the I-9 to expire and the student’s appointment will automatically be canceled. Please stop by the Student Services Office to file your I-9 form, if required.

**Curricular Practical Training (CPT) and Optional Practical Training (OPT)**: These are options for international students to obtain employment while still on a student visa. Since the degree program does not require internships or practical training, we allow students to do no more than one quarter of CPT and OPT (a total of two quarters) during the graduate program. For more information on CPT and OPT, please refer to the Bechtel International Center.

**Patent Agreement**: The patent agreement form is required for all students. If you did not receive a form, please contact the Office of Technology Licensing.

**English Placement Exam**: International students from non-English speaking countries are required to take and pass the English Placement Examination prior to the start of their Teaching or Course Assistantship appointment. Contact the English for Foreign Students Program for details.

**Part-Time Employment: Graders**

Graders are hired directly by the instructor of a course, if the instructor has secured a budget for a grader. Graders are paid on an hourly basis and there is no tuition benefit. The student must obtain information about the job expectations and limitations on hours from the hiring instructor directly. Students who accept an ME grader position should work with their group administrator for payroll processing. On-line time sheets should be submitted twice a month (by noon on the 15th and the last day of the month) and require approval by the appropriate Group Administrator. **Note**: The group that the instructor is affiliated with determines who the Group Administrator is. Please see the Group descriptions at the beginning of this handbook.

**Note**: Students on F or J visas are not authorized (per INS regulations) to perform hourly work for additional pay if they also hold a 50% assistantship appointment. International students should consult with Bechtel International Student Center for visa and employment related questions.
HOW TO OBTAIN YOUR MS DEGREE

Program Proposal

In accordance with University academic policy, MS students are required to file a program proposal by the end of the first quarter of matriculation (Honor’s Coop Students have until the 4th quarter). The departmental deadline to submit the proposal for students starting their first quarter in September 2013 is OCTOBER 25, 2013. This applies to all non-HCP MS students including those pursuing the MS in Product Design and MS in Biomechanical Engineering*.

Instructions

1. Obtain the appropriate form from the ME Student Services Office.
2. Type or print neatly. Course titles and units must be included. Illegible forms will not be reviewed or processed.
3. Consult your advisor to obtain his/her signature.
4. Submit the form to the ME Student Services Office for review and approval. Keep a copy for your own records.
5. Proposals can take up to 14 working days to be reviewed and processed. Axess will indicate the approval of your proposals under “milestones”. Proposals that are not approved will be returned to the student for revision.

*Please note: Students interested in the MS-BME program must fill out an on-line Axess petition to transfer programs from MS-ME to MS-ENGR-BME Please make sure to visit the Student Services Office BEFORE submitting the on-line petition.

All programs are subject to the approval of the student’s advisor and the Associate Chair of Graduate Curriculum (via the Student Services Manager).

Program Proposal Revision

Students who alter their MS program during their course of study must submit a new program proposal by the third week of their final quarter. This is a firm deadline and there are no exceptions. Students who fail to submit a revised program sheet by the third week of the final quarter may be forced to delay graduation.

All program revisions are subject the approval of the student’s advisor and the Associate Chair of Graduate Curriculum. It is important that you keep your advisor apprised of any changes to your program so that there are no problems when you submit your final program proposal.

Degree Conferral

Students must apply to graduate via Axess. Due dates are listed on the academic calendar posted by the Registrar’s Office. These deadlines are firm and the University does not make exceptions. If you miss the deadline, you may be able to petition with the Registrar’s Office to file your application to graduate past the deadline, but late fees will apply.

Registration is required during the degree conferral quarter; you cannot graduate during a quarter in which you are not enrolled. No exceptions.

The Student Services staff will make every effort to contact a student whose degree requirements (i.e. missing forms, missing grades) are not met prior to submitting the lists of graduating students to the University Registrar. However, due to time constraints and other demands
imposed on the staff, you are responsible to ensure you meet all graduation requirements. If you have questions about graduation and degree requirements, please contact the ME Student Services Office.

Commencement

Commencement is held annually each June. There are two ceremonies: the University ceremony (main event) and the Departmental Diploma Distribution Ceremony. Information about commencement is typically available around mid to late April.

Degree Fields

Students admitted to the MS in Mechanical Engineering will not have a field listed on the diploma (i.e. Thermosciences, Design, Flow Physics, Mechanics & Computation etc.). However, students admitted to the MS in Product Design or MS in Biomechanical Engineering will have a field listed on the diploma.

Time Limits

The University has set the following time limits for the MS degree:

1) HCP (honors cooperative students): Five years from the first quarter of enrollment in the MS program.
2) Coterminal students: Three years after the quarter in which 180 units are completed.
3) All other students: Three years from the first quarter of enrollment in the MS program, or 60 units completed.

Extensions of time limits are subject to the approval of the Department and the School of Engineering. Students having difficulty meeting the above time limits should consult their advisor and/or the Student Services Manager.
MASTER OF SCIENCE IN MECHANICAL ENGINEERING

The following requirements must be met for the MS Degree in Mechanical Engineering:

1. **Mathematical Fundamentals (6 units):** Two math courses from the following list are required for the MS degree: ME300A, ME300B, ME300C, MATH106, MATH109, CS205 A or B, CME302, EE263, EE261, STATS110, STATS141 or ENGR155C. MATH and CME courses with catalog numbers greater than 200 will also count towards the math requirement. Courses should be chosen in two different areas of mathematics (partial differential equations, linear algebra, complex variables, numerical analysis or statistics). Courses taken for the math requirement must be taken for a grade.

2. **Depth in Mechanical Engineering:** "Depth" refers to a cluster of courses with thematic and/or technical continuity that enables a student to study a part of mechanical engineering in more depth, with more focus, and over a period of time. A depth cluster or area typically is made up of 10-12 units (2-3 courses). The depth areas described on the following pages have been approved by the faculty as providing depth in specific areas as well as a significant component of applications of the material in the context of engineering synthesis. Courses taken in the depth area must be taken for a grade.

3. **Breadth in Mechanical Engineering:** "Breadth" refers to graduate level ME courses outside of the student's depth area. The intent is for students to engage in course work in areas of mechanical engineering outside of the depth to broaden understanding and competency in a wider range of topics. Two courses are required from the list of eligible breadth courses described under each depth area. Courses taken in the breadth area must be taken for a grade.

4. **Sufficient Mechanical Engineering Coursework:** Students must take a minimum of 24 units of coursework in mechanical engineering topics. For the purposes of determining mechanical engineering topics, any course on approved lists for the math requirement, depth requirement and breadth requirement counts towards these units. In addition, any graduate level course with a ME course number is considered a mechanical engineering topic. Research (independent study) units cannot count towards the 24 units of ME coursework.

5. **Approved Electives:** Additional graduate (numbered 200+) engineering, math and science courses will bring the total number of units to at least 39. All of these units must be approved by the student’s advisor. Graduate engineering, math and science courses are normally approved. Of these 39 units, no more than 6 units may come from independent study (ME391 and 392) and no more than 3 units may come from seminars. A student planning to continue for a Ph.D. should have a discussion with the academic advisor about taking ME391 or 392 during the master’s program. Approved electives must be taken for a grade unless grades are not an option (e.g. seminars and ME391 and 392).

   **Note:** Students participating in ME391 or 392 should make the necessary arrangements with a member of the faculty. In addition, the faculty member and the student should determine the number of units for the course. ME391 and 392 may only be taken on a credit / no credit basis. If a student takes an independent study in a different department, the grading option should be credit/no credit.

6. **Unrestricted Electives:** These courses will bring the total number of units submitted for the MS degree to 45. Students are strongly encouraged to take these units outside of engineering, mathematics or the sciences. Students should consult their advisor for recommendations on course loads and on ways to use the unrestricted electives to make a manageable program. Unrestricted electives may be taken credit/no credit.
7. **Laboratory Requirement**: Within the courses satisfying the requirements above, there must be at least one graduate-level course with a laboratory component. Courses which satisfy this requirement are ENGR206, ENGR341, ME203, ME210, ME218ABCD, ME220, ME250 ME294L, ME310ABC, ME317AB, ME318, ME323, ME324, ME348, ME354, ME367, or ME382AB (not ME382). ME391/392 will satisfy this requirement if 3 units are taken for work involving laboratory experiments.

Courses used to fulfill math, depth, breadth, laboratory requirement and approved electives requirements must be taken for a letter grade except when credit/no credit is given to all students. Up to 3 units of approved electives may be taken as seminars.

Candidates for the MSME degree are expected to have a minimum GPA of 3.0 in the 45 units counted towards the degree.
DEPTH AND BREADTH AREAS FOR THE MSME DEGREE

Note: Course descriptions and availability should be checked using the Stanford Bulletin and the Quarterly Time Schedules as course offerings are subject to change.

Instructions

**Depth** – Select *one* area as your specialty

**Breadth** – Select two courses (6 units) from area(s) outside your depth, as noted in each depth area description. They can come from two different areas.

**Courses marked with * indicate that they are not offered in 2013-2014**

1. **Automatic Controls** (any three of the following):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR105</td>
<td>Feedback Control Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR205</td>
<td>Introduction to Control Design Techniques (Formerly ME305)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR209A</td>
<td>Analysis and Control of Nonlinear Systems</td>
<td>3</td>
</tr>
<tr>
<td>AA203</td>
<td>Introduction to Optimal Control Theory</td>
<td>3</td>
</tr>
<tr>
<td>AA212</td>
<td>Analysis and Design of Multivariable Feedback</td>
<td>3</td>
</tr>
<tr>
<td>EE365</td>
<td>Stochastic Control</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is **Automatic Controls** (Area 1), select any **two** courses (6 units) from one or two of areas: 2-14.

2. **Biomechanical Engineering**

**Depth:** Three courses totaling at least 9 units are required. Take three courses from Group A or two courses from Group A and one course from Group B

# Indicates entire sequence must be taken.

**Group A**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME239</td>
<td>Mechanics of the Cell</td>
<td>3</td>
</tr>
<tr>
<td>ME244</td>
<td>Mechanotransduction in Cells and Tissues</td>
<td>3</td>
</tr>
<tr>
<td>ME280*</td>
<td>Skeletal Development and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>ME266</td>
<td>Intro to Physiology and Biomechanics of Hearing</td>
<td>3</td>
</tr>
<tr>
<td>ME281</td>
<td>Biomechanics of Movement</td>
<td>3</td>
</tr>
<tr>
<td>ME283*</td>
<td>Introduction to Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME287</td>
<td>Mechanics of Biological Tissues</td>
<td>3</td>
</tr>
<tr>
<td>ME294/294L</td>
<td>Medical Device Design + Lab (counts as one course)</td>
<td>4</td>
</tr>
<tr>
<td>ME327</td>
<td>Design and Control of Haptic Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME328*</td>
<td>Medical Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ME337</td>
<td>Mechanics of Growth</td>
<td>3</td>
</tr>
<tr>
<td>ME381</td>
<td>Orthopaedic Bioengineering</td>
<td>3</td>
</tr>
<tr>
<td>ME382A*</td>
<td>Medical Device Design</td>
<td>4</td>
</tr>
<tr>
<td>ME382B*</td>
<td>Medical Device Design</td>
<td>4</td>
</tr>
<tr>
<td>ME386*</td>
<td>Neuromuscular Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME484*</td>
<td>Comp. Methods in Cardio. Bioengineering</td>
<td>3</td>
</tr>
<tr>
<td>ME485</td>
<td>Modeling &amp; Simulation of Human Movement</td>
<td>3</td>
</tr>
</tbody>
</table>
### Group B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>AA242A</td>
<td>Classical Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME331A</td>
<td>Advanced Dynamics and Computation</td>
<td>3</td>
</tr>
<tr>
<td>ME331B</td>
<td>Advanced Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME338</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME340*</td>
<td>Theory and Applications of Elasticity</td>
<td>3</td>
</tr>
<tr>
<td>ME351A</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME351B</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is Biomechanical Engineering (Area 2), select any two courses (6 units) from one or two of areas 1, 3-14. If depth is other than Biomechanical Engineering (Area 2), select any courses from list A above.

3. **Mechatronics** (any two of the following):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME218A</td>
<td>Smart Product Design Fundamentals</td>
<td>4-5</td>
</tr>
<tr>
<td>ME218B</td>
<td>Smart Product Design Applications</td>
<td>4-5</td>
</tr>
<tr>
<td>ME218C</td>
<td>Smart Product Design Practice</td>
<td>4-5</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is Mechatronics (Area 3), select any two courses from one or two of the following areas: 1-2, 4-14. If depth is in an area other than Mechatronics, ME210 may be taken as a breadth course in Mechatronics.

4. **Design Methodology** (all three must be taken)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME310A</td>
<td>Project Based Eng Design, Innovation &amp; Development</td>
<td>4</td>
</tr>
<tr>
<td>ME310B</td>
<td>Project Based Eng Design, Innovation &amp; Development</td>
<td>4</td>
</tr>
<tr>
<td>ME310C</td>
<td>Project Based Eng Design, Innovation &amp; Development</td>
<td>4</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is Design Methodology (Area 4), select any two courses (6 units) from one or two of the following areas: 1-3, 5-14. If depth is in an area other than Design Methodology, ME318 and ME324 may be taken as breadth courses in Design Methodology.

5. **Manufacturing**

**Track A:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME317A</td>
<td>Design Methods: Product Definition</td>
<td>4</td>
</tr>
<tr>
<td>ME317B</td>
<td>Design Methods: Quality by Design</td>
<td>4</td>
</tr>
</tbody>
</table>

**OR**

**Track B:** Take two of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME203</td>
<td>Design and Manufacturing</td>
<td>4 Units</td>
</tr>
<tr>
<td>ME219</td>
<td>The Magic of Materials and Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>ME318</td>
<td>Computer-Aided Product Creation</td>
<td>4</td>
</tr>
</tbody>
</table>

**AND**

Take one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME233</td>
<td>Making it Big: Crossing the Entrepreneur’s Gap</td>
<td>3</td>
</tr>
<tr>
<td>ME324</td>
<td>Precision Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>
**Breadth: If depth is** **Design for Manufacturability** **(Area 5), select any two courses from one or two of the following areas: 1 - 4, 6 -14.**

**6. Fluid Mechanics** (both must be taken)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME351A</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME351B</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

PLUS ONE OF THE FOLLOWING

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME355</td>
<td>Compressible Flow</td>
<td>3</td>
</tr>
<tr>
<td>ME361</td>
<td>Turbulence</td>
<td>3</td>
</tr>
<tr>
<td>ME451A/B/C*</td>
<td>Advanced Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME457</td>
<td>Fluid Flow in Microdevices</td>
<td>3</td>
</tr>
<tr>
<td>ME461*</td>
<td>Advanced Topics in Turbulence</td>
<td>3</td>
</tr>
</tbody>
</table>

Students with exceptionally strong backgrounds in Fluid Mechanics may substitute ME351A and/or ME351B with other courses listed in this depth area (with advisor’s consent)

**Breadth: If depth is** **Fluid Mechanics** **(Area 6), select any two courses from one or two of the following areas: 1-5, 7 (excluding 352C), 8-14.**

**7. Energy Systems** (both)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME370A</td>
<td>Energy Systems I: Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME370B</td>
<td>Energy Systems II: Modeling and Advanced Concepts</td>
<td>4</td>
</tr>
</tbody>
</table>

PLUS ONE OF THE FOLLOWING:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME250</td>
<td>Internal Combustion Engines</td>
<td>3-5</td>
</tr>
<tr>
<td>ME260</td>
<td>Fuel Cells Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ME370C</td>
<td>Energy Systems III: Projects</td>
<td>3-5</td>
</tr>
</tbody>
</table>

**Breadth: If depth is** **Energy Systems** **(Area 7), select any two courses from one or two of the following areas: 1-6, 8-14.**

**8. Heat Transfer** (any three of the following)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME352A*</td>
<td>Radiative Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME352B</td>
<td>Fundamentals of Heat Conduction</td>
<td>3</td>
</tr>
<tr>
<td>ME352C</td>
<td>Convective Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME358</td>
<td>Heat Transfer in Microdevices</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth: If depth is** **Heat Transfer** **(Area 8), select any two courses from one or two of the following areas: 1-5, 6 (okay if depth does not include 352C), 7, 9-14.**
9. **High Temperature Gas Dynamics**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME362A</td>
<td>Physical Gas Dynamics</td>
<td>3</td>
</tr>
</tbody>
</table>

PLUS TWO OF THE FOLLOWING

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME362B*</td>
<td>Nonequilibrium Processes in High-Temperature Gases</td>
<td>3</td>
</tr>
<tr>
<td>ME364</td>
<td>Optical Diagnostics and Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>ME371</td>
<td>Combustion Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>ME372</td>
<td>Combustion Applications</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is **High Temperature Gas Dynamics** (Area 9), select any **two** courses from one or two of the following areas: 1-7, 10-14.

10. **Solid Mechanics** (Any three of the following):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME333</td>
<td>Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME335A</td>
<td>Finite Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME335B*</td>
<td>Finite Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME335C</td>
<td>Introduction to Boundary Element Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME338</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME338B*</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME340</td>
<td>Theory and Applications of Elasticity</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is **Solid Mechanics** (Area 10), select any **two** courses from one or two of the following areas: 1-9, 11-14. If depth is in an area other than Solid Mechanics, ME337*, ME339 and ME346AB may be taken as breadth courses in Solid Mechanics.

11. **Dynamics:** Both courses, plus AA242A or one more course approved by the advisor

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME331A</td>
<td>Advanced Dynamics and Computation</td>
<td>3</td>
</tr>
<tr>
<td>ME331B</td>
<td>Advanced Dynamics and Simulation</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is **Dynamics** (Area 11), select any two courses from one or two of the following areas: 1-10, 12-14.

12. **MEMS** (Three courses required. Two or three of the following):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR240</td>
<td>Intro to M/NEMS</td>
<td>3</td>
</tr>
<tr>
<td>ENGR341</td>
<td>Micro/Nano Systems Design &amp; Fabrication Lab</td>
<td>3-5</td>
</tr>
<tr>
<td>ENGR342</td>
<td>MEMS Lab II</td>
<td>3-4</td>
</tr>
<tr>
<td>ME321</td>
<td>Optofluidics</td>
<td>3</td>
</tr>
<tr>
<td>ME358</td>
<td>Heat Transfer in Microdevices</td>
<td>3</td>
</tr>
<tr>
<td>ME414*</td>
<td>Solid State Physics Issues for ME Experiments</td>
<td>3</td>
</tr>
<tr>
<td>ME457</td>
<td>Fluid Flow in Microdevices</td>
<td>3</td>
</tr>
</tbody>
</table>

Plus (if only two were taken from above)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSCI316</td>
<td>Nanoscale Science, Engineering and Technology</td>
<td>3</td>
</tr>
</tbody>
</table>
**Breadth:** If depth is MEMS (Area 12), select any two courses from one or two of the following areas: 1-11, 13, 14

### 13. Robotics and Kinematics (any three of the following)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME320</td>
<td>Introduction to Robotics</td>
<td>3</td>
</tr>
<tr>
<td>CS225A</td>
<td>Experimental Robotics</td>
<td>3</td>
</tr>
<tr>
<td>CS327A*</td>
<td>Advanced Robotics (Formerly ME327A)</td>
<td>3</td>
</tr>
<tr>
<td>ME322</td>
<td>Kinematic Synthesis of Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>ME327</td>
<td>Design and Control of Haptic Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME328*</td>
<td>Medical Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ME330*</td>
<td>Advanced Kinematics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is Robotics and Kinematics (Area 13), select any two courses from one or two of the following areas: 1-12,14.

### 14. Materials and Stress Analysis (any three of the following)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME219</td>
<td>The Magic of Materials and Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>ME309*</td>
<td>Finite Element Analysis in Mechanical Design</td>
<td>3</td>
</tr>
<tr>
<td>ME345</td>
<td>Fatigue Design and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ME348*</td>
<td>Experimental Stress Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

**Breadth:** If depth is Materials and Stress Analysis (Area 14), select any two courses from one or two of the following areas: 1-13.

**MASTER OF SCIENCE IN ENGINEERING**

**Field Designation: Biomechanical Engineering**

The Master of Science in Engineering: Biomechanical Engineering (MSE:BME) promotes the integration of engineering mechanics and design with the life sciences. The eligibility requirements for this degree program are the same as for the Master of Science in Mechanical Engineering. Applicants are expected to have an additional exposure to biology and/or bioengineering in their undergraduate studies. Students planning for subsequent medical school studies are advised to contact Stanford’s Premedical Advising Office in Sweet Hall.

In addition to the above eligibility requirements, students wishing to pursue this program must get approval from the Student Services Office and then complete the on-line Graduate Authorization Petition.

**Degree Requirements:**

1. Mathematical competence (min 6 units) in two of the following areas: partial differential equations, linear algebra, complex variables, or numerical analysis, as demonstrated by completion of two appropriate courses from the following list: ME300A,B,C; MATH106, MATH109, MATH113, MATH131M/P, MATH132; STATS110, or ENGR155C; CME108, CME302.

Students who have completed comparable graduate-level courses as an undergraduate, and who can demonstrate their competence to the satisfaction of the instructors of the Stanford courses, may be waived via petition from this requirement by their advisor and the Student
Services Office. The approved equivalent courses should be placed in the “approved electives” category of the program proposal.

2. Graduate Level Engineering Courses (minimum 21 units), consisting of
   a) Biomechanical engineering restricted electives (9 units) to be selected from: ME239, ME244, ME266, ME280, ME281, ME283, ME287, ME328, ME337, ME381, ME382AB.
   b) Specialty in engineering (9-12 units): A set of three or four graduate level courses in engineering mechanics, materials, controls, or design (excluding bioengineering courses) selected to provide depth in one area. Such sets have been approved by the Mechanical Engineering faculty. Comparable specialty sets composed of graduate engineering courses outside the Mechanical Engineering Department can be used with the approval of the student’s advisor. Examples can be obtained from the Biomechanical Engineering Group Office (Durand 223).
   c) Graduate engineering electives (to bring the total number of graduate level engineering units to at least 21). These electives must contribute to a cohesive degree program, and be approved by the student’s advisor. No units may come from bioengineering courses, mathematics courses, or seminars.

3. Life science approved electives (minimum 6 units): Undergraduate or graduate biological/medical science/chemistry courses which contribute to a cohesive program.


5. General approved electives (to bring the total number of units to 39): These courses must be approved by the student’s advisor. Graduate level engineering, math, physical science courses and upper division undergraduate or graduate life science courses are normally approved.

6. Unrestricted electives (to bring the total number of units to 45): Students without undergraduate biology are encouraged to use some of these unrestricted units to strengthen their biology background. Students should consult their advisor for recommendations on course loads and on ways to use the unrestricted electives to create a manageable program.

   All courses except unrestricted electives must be taken for a letter grade unless letter grades are not an option.

MASTER OF SCIENCE IN ENGINEERING
Field Designation: Product Design

The Masters Program in Design focuses on the synthesis of technology with human needs and market viability (both profit and non-profit models) to create innovative products, services, and experiences. This program is offered jointly by the departments of Mechanical Engineering and Art and Art History. It provides a design thinking education that seeks to create design leaders who can transform organizations into cultures of creativity and innovation. Students entering the program from the engineering side earn a Master of Science in Engineering degree with a concentration in Design (MSE – Design), those from the Art side earn a Master of Fine Arts in Design (MFA - Design). Students complete the core product design courses in their first year of graduate study at Stanford before undertaking the master's project in their second year.
**MSE-Product Design Degree Requirements**

Students must complete the following courses. Students making unsatisfactory degree progress by the end of the first year may, at the faculty's discretion, not advance to the masters project year. A minimum cumulative GPA of 3.0 and 60 units is required for degree conferral.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Quarter</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME313</td>
<td>Human Values &amp; Innovation in Design</td>
<td>Fall -1st year</td>
<td>3</td>
</tr>
<tr>
<td>ME203</td>
<td>Design &amp; Manufacturing</td>
<td>Fall-1st year</td>
<td>4</td>
</tr>
<tr>
<td>ARTSTUDI 350A</td>
<td>Art In Context I: Post-Readymade Production**</td>
<td>Fall-1st year</td>
<td>3</td>
</tr>
<tr>
<td>ME277</td>
<td>Graduate Design Research Techniques</td>
<td>Winter-1st year</td>
<td>3-4</td>
</tr>
<tr>
<td>ME312</td>
<td>Advanced Product Design: Formgiving</td>
<td>Winter-1st year</td>
<td>3</td>
</tr>
<tr>
<td>ARTSTUDI 350B</td>
<td>Art In Context II: Expanded Forms, Alternative Functions**</td>
<td>Winter-1st year</td>
<td>3</td>
</tr>
<tr>
<td>ME316A</td>
<td>Masters Design Project – Engineering-side*</td>
<td>Fall 2nd Year</td>
<td>4-6</td>
</tr>
<tr>
<td>ME316B</td>
<td>Design Garage – the Masters Thesis sequence and a d.school class*</td>
<td>Winter 2nd Year</td>
<td>4-6</td>
</tr>
<tr>
<td>ME316C</td>
<td>Design Garage – the Masters Thesis sequence and a d.school class*</td>
<td>Spring 2nd Year</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>Approved electives***</td>
<td>Total:</td>
<td>60</td>
</tr>
</tbody>
</table>

* ME 316: Product Design Master's Project A, B & C are taken sequentially for three quarters during the second year. ME316B & C are listed on the d.school website as Design Garage: A Deep Dive in Design Thinking. Students in the Masters of Science program must take this sequence for 4-6 units per quarter.

** ArtStudio 350 A & B are taken sequentially for two quarters during the first year, starting in the Fall quarter.

***Students may choose classes (at the 200 level or higher) from any of the schools at the University to fulfill their elective requirement. However, electives that are not already pre-approved must be approved by the student's adviser via petition prior to enrollment. Electives should be chosen to fulfill career objectives; students may focus their energy in engineering, entrepreneurship and business, psychology, or other areas relevant to design. Taking a coherent sequence of electives focused on a subject area is recommended. For example, the patent, negotiation, and licensing classes (ME 208 Patent Law and Strategy for Innovators and Entrepreneurs, ME 265 Technology Licensing and Commercialization) constitute a sequence most relevant to potential inventors. Students interested in social entrepreneurship should apply to the d.school course ME 206A Entrepreneurial Design for Extreme Affordability.

Note: All required and approved electives must be taken for a letter grade unless prior approval is granted to take a class CR/NC.
Pre-Approved Electives List: The following courses are pre-approved for fulfilling the elective requirement for the master's degree in Engineering - Design. Electives taken that are not on this list must be approved via petition prior to enrollment. These must be taken for a letter grade unless prior approval is obtained.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME208</td>
<td>Patent Law and Strategy for Innovators and Entrepreneurs</td>
<td>2-3</td>
</tr>
<tr>
<td>ME212</td>
<td>Calibrating the Instrument</td>
<td>1</td>
</tr>
<tr>
<td>ME238</td>
<td>Patent Prosecution</td>
<td></td>
</tr>
<tr>
<td>ME265</td>
<td>Technology Licensing and Commercialization</td>
<td>3</td>
</tr>
<tr>
<td>ME 297</td>
<td>Forecasting for Innovators: Technology, Tools &amp; Social Change</td>
<td>3</td>
</tr>
<tr>
<td>ME304</td>
<td>The Designer’s Voice</td>
<td>1</td>
</tr>
<tr>
<td>ME315</td>
<td>The Designer in Society</td>
<td>3</td>
</tr>
<tr>
<td>MS&amp;E 273</td>
<td>Technology Venture Formation</td>
<td>3-4</td>
</tr>
<tr>
<td>STRAMGT S353</td>
<td>Entrepreneurship: Formation of New Ventures</td>
<td>4</td>
</tr>
<tr>
<td>STRAMGT S356/366</td>
<td>The Startup Garage: Design, Testing and Launch</td>
<td>4</td>
</tr>
</tbody>
</table>

STRAMGT S353 - Entrepreneurship: Formation of New Ventures
STRAMGT S356/366 - Evaluating Entrepreneurial Opportunities

Additional Requirements:

As part of their master's degree program, and in addition to Design Garage (ME316B/C), students are required to take at least one course offered by the Hasso Plattner Institute of Design (the d.School). All d.School courses require applications submitted the quarter prior to the start of class. All d.school classes (with the exception of “Pop-Ups”) count as pre-approved electives. Suggested classes are found below.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 206A/206B</td>
<td>Entrepreneurial Design for Extreme Affordability****</td>
<td>4</td>
</tr>
<tr>
<td>ME301</td>
<td>LaunchPad</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 231</td>
<td>Transformative Design</td>
<td>3-5</td>
</tr>
<tr>
<td>ENGR 280</td>
<td>From Play to Innovation</td>
<td>2-4</td>
</tr>
<tr>
<td>ENGR 281</td>
<td>d.media 4.0 - Designing Media that Matters</td>
<td>2-3</td>
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****Students who opt to take ME206A/B – Entrepreneurial Design for Extreme Affordability as one of their pre-approved electives should take this sequence in the first year. This shifts ME312 from the Winter quarter - first year to Winter quarter - second year of their academic program.

MASTER OF SCIENCE IN ENGINEERING (no field designation)

As described in the School of Engineering section of the Bulletin, each department in the School of Engineering may sponsor students in a more general degree, the Master of Science in Engineering. Sponsorship by the Department of Mechanical Engineering requires that the student submit a petition for admission to this program and that the “center of gravity” of the proposed program lie in Mechanical Engineering. The petition must be submitted no later than the 2nd quarter of the MS program, along with a statement explaining the objectives of the program, how it is coherent, contains depth, and fulfills well-defined career objectives. The proposed program must include a minimum of 9 units of graduate level work in the Department of Mechanical
Engineering. The graduation requirements are the same as for the Master of Science in Mechanical Engineering.

If you choose to go this route, please be sure that you are included in the e-mail lists that are managed by the Student Services Office in the Mechanical Engineering Department. Since students following this path are considered students of the School of Engineering (as opposed to the Department of Mechanical Engineering) important communications originated from the Mechanical Engineering Department may not reach you if you are not proactive in this regard.

**DEGREE OF ENGINEER**

The basic University requirements for the degree of Engineer are described in the “Degree” section of the Stanford Bulletin. The program is designed for students who desire to engage in more specialized study than the MS students, and who plan to take up professional engineering work upon graduation.

The admission standards for this program are substantially the same as for the Master’s degree. However, since thesis supervision is required, the department cannot admit a student to the program until the student has personally arranged for a faculty member to supervise their research project. This will frequently involve a paid research assistantship awarded by an individual faculty member (usually on a sponsored research project). Students studying for their Master’s degree at Stanford who wish to continue for the Engineer’s degree ordinarily make such arrangements during their MS program.

The department requirements for the degree include a thesis, for which up to 18 units of credit will be allowed (ME400). In addition to the thesis, 27 units of approved course work in mathematics, science and engineering are required beyond the requirements for the Master of Science degree. The choice of courses is subject to the approval of the advisor. Students who have not fulfilled the Stanford MS degree requirements will be required to do so (up to 45 units may be transferred via petition for an MS degree received from another institution). A total of 90 units is required for the program.

All candidates for the degree of Engineer will be expected to have the approval of the faculty and to have a minimum grade point average of 3.0 for all courses (exclusive of thesis credit) taken beyond those required for the Master’s degree.

**DOCTOR OF PHILOSOPHY**

The basic University requirements are discussed in the “Degrees” section of the Stanford Bulletin. The Ph.D. degree is intended primarily for students who plan for a career in research or teaching. For these endeavors a broad background in mathematics and engineering, along with intensive study and research experience, is necessary.

*Since thesis supervision is required, admission is not granted until the student has personally arranged for funding and supervision by a faculty member.*

The Mechanical Engineering Department encourages all PhD students to make early and steady progress towards completion of the PhD. Obviously, the primary responsibilities for monitoring the progress of these PhD students lie with the PhD research advisor. The Department Student Services Office and the Graduate Curriculum Committee also has some broad oversight responsibility. In addition to the completion of the PhD qualifying exam, students are required to provide periodic progress reports as described below. Some aspects of these requirements had been informally encouraged in the past; these are now *requirements that must be met for TA*
and RA Appointments to be approved, and all PhD students are strongly encouraged to meet quickly with their advisors and make plans to come into compliance.

Important note: If the primary research supervisor is emeritus or not from the ME department (Courtesy Appointments do not count as ME faculty), the student must secure an agreement with an ME faculty member to serve as co-advisor.

MS Students interested in continuing towards a Ph.D. degree must secure funding and faculty supervision. If the faculty advisor is emeritus, appointed by courtesy, or from another department, a co-advisor from ME is required. Once accomplished, a “Graduate Authorization Petition” (online via Axess) and departmental cover sheet must be completed and submitted to the ME Student Services Office well in advance of the MS degree conferral. Please get approval before filing petition online. Failure to submit this petition on time will force the MS student to apply for the Ph.D. program through the regular admissions process, pay application fees, etc. Please contact the ME Student Services Office with questions.

Steps to Obtain the Ph.D. Degree

1. Ph.D. Qualifying Examination: PhD Students who entered the MS program at Stanford are required to take the PhD Qualifying exam at or before the start of the 3rd year of graduate school. For students beginning their graduate work after completing a MS elsewhere, the exam must take place at or before the start of their second year at Stanford. Exams are given during the 3rd week of the Fall and Spring academic quarters. Exams will be based on 3 topics from an approved list that is based on the Depth topic list for the MS degree.

At the completion of the first attempt at the exam, students who have passed all three topics are considered to have passed the exam. Students who did not pass one or more topics on the first attempt may re-take the exam one time, during the next offering of the exam, subject to support of their advisor. Students may re-take the failed subjects, or select new subjects. If the student passes the remaining subjects during the re-take, the student is considered to have passed the exam. Outcomes for students who do not pass one or more subjects during the retake will be determined by the graduate curriculum committee. Details of the Qualifying Exam process are below.

2. Ph.D. candidacy: To achieve Ph.D. candidacy status, the student must file the Ph.D. candidacy form (University policy requires that this form be filed by the end of the 6th quarter of the student’s post-master’s registration). This usually takes place immediately following successful completion of the qualifying exam. Stanford funding and future registration will be placed on hold until the student complies with the policy. The candidacy form is to be approved and signed by the advisor and the Associate Chair of Graduate Curriculum (via the ME Student Services Office). Students are expected to complete their program within five years from the date that candidacy is granted.

3. Reading committee: After attaining Ph.D. Candidacy, in consultation with the advisor, the student must form a reading committee. The reading committee approves the program of advanced course work beyond the MS, including the technical breadth requirement. A formal reading committee form must be completed and filed with the Student Services Office prior to the dissertation proposal presentation (Step 5). Most students submit the Reading Committee Form at the same time the candidacy paperwork is filed. University policy requires appointment of a research co-advisor from the home department if former Academic Council members, emeritus Academic Council members, or non-Academic Council members are to server as the principal dissertation advisor. If the principal dissertation advisor is not from the ME department, the student must secure an ME faculty member to serve as a
member of the PhD dissertation reading committee and an ME faculty member to serve as an academic co-advisor (courtesy appointments do not count as ME faculty).

Please consult the Graduate Academic Policy for guidelines on how to form your reading committee.

4. Initial Dissertation Proposal: PhD students are required to prepare a written Initial Dissertation Proposal no later than the end of the Second year after the start of their PhD program. All current PhD students who have been in their PhD program for more than 2 years are required to prepare and submit a written Initial Dissertation Proposal within 3 months. This Initial Proposal is submitted to the Student Services Office, and to the Reading Committee assigned to the student's PhD thesis. The Dissertation Proposal should be no more than 7 pages in length.

The purpose of the Dissertation Proposal is to trigger discussions and longer-term thinking about the goals of the PhD research at an early stage of the project. It is understood, and even expected, that the finished PhD research may depart significantly from this early plan.

5. Revised Dissertation Proposal: PhD students are required to prepare a Revised Dissertation Proposal no later than the end of the 5th year of their PhD research, and no later than 12 months prior to a planned PhD Defense. This Revised Proposal is submitted to the Student Services Office and the PhD reading committee. The revised dissertation proposal is expected to be an accurate description of the goals of the PhD project as the project is nearing completion.

6. Green Light Meetings: Within 6 months of submission of the revised dissertation proposal, and no less than 6 months prior to the planned PhD Defense, the Student and the reading committee are required to meet in a "Green Light Meeting". In this meeting, the Revised Dissertation Proposal will be reviewed and discussed, and the student will present a "Draft PhD Thesis outline" indicating status of prior work and plans for additional work. The presentation should not be a "practice thesis defense presentation", but rather should be focused on the status of completion of the project, a chapter-by-chapter review of the status of completion of each part of the expected PhD thesis. A month-by-month schedule for the time remaining to the PhD Defense should be presented at this meeting. The purpose of this green light meeting is to make sure that the entire reading committee is familiar with the plans for the completed PhD thesis, and is comfortable with the proposed content and the schedule. At the conclusion of the meeting, a brief report is prepared and delivered to the student services office using a form provided by the student services office. This report should indicate the target dates for the PhD Defense and completion of the PhD Thesis as agreed to by the reading committee, and is signed by the PhD Advisor.

PhD students who are in their PhD program for more than 6 years are required to organize annual "Green Light Meetings" with their reading committee and submit meeting reports to the Student Services Office until completion of the PhD Thesis Defense.

7. Progress Reporting on PhD Dissertation Proposals and Green Light Meetings: The student services office will withhold approval for RA and TA Appointments for PhD Students who have not completed the required Initial or Revised Dissertation Proposal, and Green Light Meeting.

8. Teaching Requirement: An important aspect of a Ph.D. from Stanford is the demonstrated ability to communicate fundamental concepts and unique ideas to a diverse audience. Excellent preparation for communication ideas in industry or academia is through teaching
experience. To that end, Ph.D. students must 1) complete course assistant training from the Center for Teaching and Learning and 2) obtain teaching experience equivalent to at least a 25% course assistantship and three units of ME491 “Ph.D. Teaching Experience” or similar teaching experience which may include equivalent teaching preparation, lecturing, leading sessions, tutoring, or scientific or engineering outreach. Definition of the nature and scope of the teaching experience and fulfillment of this requirement will be certified by the Ph.D. advisor. This policy will apply to all Ph.D. students who start their Ph.D. program in fall 2007 or later. Students formally hired as TAs and CAs are required to complete the TA Training program given by the department (and enroll in ME492 for one unit).

9. Course work: Ph.D. candidates must complete a minimum of 135 units (Ph.D. candidates who received their MS from Stanford may count up to 45 units towards the 135 total). Out of the 135 units, a student must complete a minimum of 27 units of approved courses in advanced study (excluding research, directed study, seminars and ME491) beyond the MS degree. These units must be taken for a letter grade. The courses should consist of upper level graduate courses in engineering and sciences. In addition, all Ph.D. candidates must participate in their area’s research seminar each quarter. Students who received an MS degree at another institution may petition to transfer up to 45 units towards the 135 unit requirement.

The Mechanical Engineering department has a breadth requirement for the Ph.D. program. This may be satisfied either by a minor in another department or by at least 9 units of course work covering physical principles or methodologies outside the student’s primary area of research. Candidates with primarily experimental projects should include at least three units on experimental techniques. If choosing to take a Ph.D. minor in another department, the 20 units required for the minor program may be included within the 135 units required for the Ph.D. Up to 9 of the units used for the Ph.D. minor may be included in the 27 units of coursework required.

10. University oral examination: Any time after completing an acceptable draft of the dissertation, with the approval of the advisor and reading committee, the student may schedule the university oral examination (Dissertation Defense). To do so requires completion of the university Oral Exam Schedule form (available from the University Registrar’s website). The form must be submitted for approval at least two weeks prior to the day of the exam. It is the student’s responsibility to schedule the time and day of the exam and ensure that all examiners are available to attend.

For information on forming your Oral Exam Committee, please see the Graduate Academic Policy.

Once the Oral Exam Schedule has been approved by the Student Services Manager, the student should pick up the approved petition and accompanying information to give to the Chair of the committee at least two days in advance of the exam date. If the Chair of the exam does not have the approved petition prior to the start of the exam, the exam will be invalid.

The Orals Chair should submit the results of the examination to the Student Services Office immediately following the exam. The student’s advisor will notify the student of the outcome.

Note: Students must be registered during the quarter in which the examination is taken.

Ph.D. Qualifying Exam

Exam Structure

PhD Students who entered the MS program at Stanford are required to take the qualifying exam at or before the start of the 3rd year of graduate school. For students beginning their graduate work after completing a MS elsewhere, the exam must take place at or before the start of their second year at Stanford.

Exams are given during the 3rd week of the Fall and Spring academic quarters. Exams will be based on 3 topics from the list below. The exam will usually consist of 30-minute topical exams in three subjects chosen by the student in consultation with their advisor from the list below. Please note that if one of your topics is customized, you should plan for one hour for the custom exam.

Examiners for exams for the standard topics will be selected by the Graduate Curriculum Committee. The selections will be made on the basis of the faculty expertise and experiences with the courses that are the basis of the topical exams, and with a goal of distributing workload evenly where possible. It is possible that the advisor for a PhD student will be one of the examiners on a single topical exam on occasion. The curriculum committee will ensure that the advisor is not the examiner for more than one topic for one of their own PhD students, and that they are not the examiner for the custom topic exams.

Custom Subject - This exam may consist of a research exam with a presentation, or a topical exam in a topic not represented above. It is important for the Custom Subject Proposal to describe how the content of the Custom Exam is distinct from the content of the 2 topical exams already being selected.

Custom exams are private events, and may be attended by other faculty, but not by students, family and friends. If the examination consists of a presentation followed by Q&A, the advisor may attend the entire session as a “silent observer”. Other faculty are excused after completion of the presentation portion of the examination.

Detailed proposals for a Custom Exam topic are to be prepared with and signed by the research advisor, and will be approved or rejected by the Graduate Curriculum Committee. The Graduate Curriculum Committee will select 2 examiners from the list of 3 or more names provided in the application.

The recommended format for custom research exams is based on a 20-minute presentation related to the PhD research that the student is working on, followed by up to 40 minutes of questions by 2 examiners.

Looking ahead, we would like to offer some additional guidance on the format and execution of these custom exams:

1) The goal of the presentation is to demonstrate that the student can explain some specific key issue in their proposed research, and describe the work that they are doing to resolve this issue. The content of the presentation should be accessible to faculty with modest expertise in the PhD research topic. Therefore, it is the responsibility of the student to prepare a presentation that is clear and informative, and which can serve as the basis for rigorous questions by many faculty in our department.
2) It is the responsibility of the Student and Advisor to define a custom examination specification that is clearly distinct from the content of the 2 topical examinations. Specifications that do not address this distinction in detail will be rejected.

Administrative Procedures

1. Obtain the Nomination of a Faculty Sponsor. An Academic Council Member of Stanford University must be willing to supervise and support your Ph.D. program and dissertation. The decision by the faculty member to supervise the program and dissertation is based on your potential to become an independent scholar, as well as many other factors, including your undergraduate and graduate course record, research, teaching, and professional experience. The most important factor in this nomination is the direct knowledge the faculty sponsor has of your research capabilities, and their belief that you are qualified to pursue a PhD at Stanford University on the basis of this knowledge.

If the Research Advisor is from outside of the Mechanical Engineering Department (or is a faculty in M.E. by courtesy, or an emeritus faculty), an ME Department faculty member must be willing to serve as Academic Co-Advisor throughout the PhD. In this case, the nomination is still provided by your research advisor, and is signed by your academic advisor.

2. Prepare an Application Folder. The folder includes:
   a) Updated transcripts of all non-Stanford graduate course and Stanford graduate course work. A GPA of 3.5 or higher is required. The GPA calculation must be based entirely on letter grades in Math, Science and Engineering classes at the graduate level. Grades from independent study or dissertation research are not to be included in this calculation. (Exceptions to the GPA requirement must be requested by petition written and signed by the research advisor.)
   b) Curriculum vitae including standardized examination scores prior to admission.
   c) Preliminary dissertation proposal (two to three pages) providing a rationale and methodology for the proposed research. Examiners will have access to this proposal, and may use it as a basis for exam questions.
   d) The nomination form signed by your research advisor.

NOTE: All exceptions to all eligibility and timing requirements are subject to petitions to be signed by the Research Advisor, and reviewed by the Chair of the Graduate Curriculum Committee.

3. Choose Three Subjects. Together with your faculty sponsor, choose any three subjects from the list below. For each topic, the student will list the 2 or more course numbers within that topic area that they will prepare to be examined on. For each of the subjects, descriptions of the materials to be used as a basis for the exam will be provided. Individual topic descriptions are being drafted by the GCC with support of the faculty likely to be involved in those topics.

   Math: Exam is based on ME300A/ME300B/ME300C (Linear Algebra/PDEs/Numerical Methods) – Please select 2 out of 3 of these classes, or indicate 2 other classes.

   Automatic Controls: This exam will be based on the content normally offered in E105 + E205, with some practical content from ME206 if appropriate.

   BioMechanical Engineering: BME exams are based on any 2 of these courses: ME239, ME281, ME283, ME287, ME337, ME381
Mechatronics: This exam will be based on ME218AB or ME210+ME220.

Design Methodology: This exam will be based on ME310AB

Design for Manufacturing: This exam will be based on ME317AB

Fluid Mechanics: based on 2 of ME351A, ME351B, {ME355 or AA210A}

Energy Systems: This exam is based on 370A-C. Taking 370A and either 370B or C should prepare the student for this exam.

Reactive Gas Dynamics (formerly HT Gas Dynamics): This exam is based on ME362A, ME362B, ME364, ME371 and ME372. The student will be examined on material covered in any two courses selected from this sequence.

Heat Transfer: This exam is based on ME 352 A, B, C and ME 358. The student will be examined on material covered in any two courses selected from this sequence.

Solid Mechanics: This exam is based on {ME333 and 338A or 340A}, or {335A and 335B or 335C}.

Dynamics: This exam is based on ME331AB

MEMS and Devices: This exam is based on content in E240, E341, ME414 and ME457, based on the courses indicated.

Robotics and Kinematics: This exam is based on CS223A + one of CS225A, ME322, or ME326.

Materials and Stress Analysis: Exam based on any 2 courses selected from ME345, MatSci270, ME309, ME348

4. Submit the Examination Application. The research advisor is required to sign the qualifying exam application. The application deadline is set by the department, generally 2 months prior to the exams.

5. Take the Exam. The time and locations of the exams will be provided by the Student Services Office.
**HONOR CODE**

Stanford examinations are not proctored. We expect students to behave as mature adults, and to be judged on the basis of knowledge that they alone possess.

This is not the tradition at many other universities. We live by the honor code, and to do so we must support it. This means that students should report observed honor code violations, and the faculty is committed to a quick and just resolution of each case of suspected violation through established administrative practices.

We do deal firmly with honor code violations. Students have been suspended, and have had degree conferral delayed, following convictions for honor code violations.

Stanford University Honor Code

A. The Honor Code is an undertaking of the students, individually and collectively;

1. that they will not give or receive aid in examinations; that they will not give or receive un-permitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;
2. that they will do their share and take an active part in seeing to it that others as well as themselves uphold the spirit and letter of the Honor Code.

B. The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid, as far as practicable, academic procedures that create temptations to violate the Honor Code.

C. While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to establish optimal conditions for honorable academic work.

Please visit the Office of [Community Standards Website](#) for more information on the Honor Code.

**PLACES TO GET HELP**

If you find yourself in an overwhelming situation, rather than letting things build up until you can no longer handle it, there are several individuals and offices that can help. Here is just a sample of places you can turn. They are not listed in any particular order, so feel free to contact whomever you feel most comfortable with.

- **CAPS** - Counseling Services (CONFIDENTIAL unless a mandated reporting issue): 2nd floor, Vaden Health Center: Crisis Center, stress management center, support groups, individual counseling
- **Graduate Life Office**: 2nd floor of the Graduate Community Center: offers support and assists with connecting students to necessary resources for personal and academic issues.
- Your academic advisor or another faculty member that you feel comfortable with
- Indrani Gardella, Student Services Manager, Mechanical Engineering Department, Building 530, Room 125
- Professor Tom Bowman, Chair of Graduate Curriculum Committee, Building 520
• Sally Gressens, Assistant Dean of Student Affairs, School of Engineering, Huang Building

FOR ADDITIONAL ASSISTANCE

Center for Teaching and Learning - Sweet Hall, room 110
Services to students:
♦ Courses to Improve Learning Effectiveness
♦ One-on-one Study Skills Counseling
♦ Tutoring and Tutor Training

Bechtel International Center
583 Lagunita Drive (behind Tresidder Union)
For assistance with cultural and language problems as well as visas/passport issues
Excellent resource for spouses/families too!

REFERENCE GUIDES

Graduate Academic Policies and Procedures: http://gap.stanford.edu/
This Handbook is a collection of information about University policies, requirements, and resources relevant to all Stanford graduate students

Course descriptions, as well as University and School policies

Revised 3/13/14