Mechanical Engineering

Bachelor of Science (BS)

Mechanical engineers serve society by solving problems in transportation, energy, the environment, and human health. The activity of mechanical engineers extends from the investigation of physical phenomena governing the behavior of our surroundings to the manufacture and evaluation of products. The mechanical engineering profession encompasses numerous technical areas, including acoustics, automatic control, bioengineering, combustion, cryogenics, design, dynamics, energy conversion, engines, environment, heat transfer, lubrication, mass transfer, manufacturing and sustainability, materials processing, mechanics of solids and fluids, mechanisms, plasma dynamics, propulsion, thermodynamics, vibration, and wave propagation.

The undergraduate program in mechanical engineering seeks to provide students with a broad education emphasizing an excellent foundation in scientific and engineering fundamentals. The objectives of the undergraduate program are to prepare undergraduate students for employment or advanced studies with four primary constituencies: industry, the national laboratories, state and federal agencies, and academia (graduate research programs).

Accreditation

Our programs are accredited by ABET (http://www.abet.org/accreditation/), a non-profit and non-governmental accrediting agency for academic programs in the disciplines of applied science, computing, engineering, and engineering technology. ABET is a recognized accreditor in the United States (U.S.) by the Council for Higher Education Accreditation (http://www.chea.org/). For information about how the program achieves ABET course outcomes, please see the Department's website (http://www.me.berkeley.edu/undergraduate/degree-program/program-objectives-and-outcomes-abet/).

Admission to the Major

Prospective undergraduates in the College of Engineering will apply for admission to a specific program in the college. For further information, please see the College of Engineering's website (http://coe.berkeley.edu/students/prospective-students/admissions.html).

Admission to Engineering via a Change of College application for current UC Berkeley students is highly unlikely and very competitive as there are few, if any, spaces that open in the college each year to students from other colleges at UC Berkeley. For further information regarding a Change of College to Engineering, please see the College's website (http://coe.berkeley.edu/students/current-undergraduates/change-of-college/).

Five-Year BS/MS Program

This program is for Berkeley ME undergraduates who wish to broaden their education experiences at Berkeley. In contrast to the standard MS program, this BS/MS program is completely course-based. Students in the five-year BS/MS program are also able to take some courses in professional disciplines such as business or public policy. This two-semester program is not intended for students with the desire to continue to the PhD. For further information regarding this option, please see the department's website (http://www.me.berkeley.edu/graduate/degree-programs/five-year-bsms-program/).

Minor Program

The department offers two minor programs, one in Mechanical Engineering and one in Aerospace Engineering. For admission to either minor program, students must have a minimum overall grade point average (GPA) of 3.00 as well as a minimum 3.00 GPA in the prerequisite courses. For information regarding the prerequisites for each of the minors, please see the Minor Requirements tab on this page.

After completion of the prerequisite courses, students will need to complete and submit to the Mechanical Engineering Student Services Office (Room 6189/6193 Etcheverry) a Petition for Admission form which can be found here (http://www.me.berkeley.edu/undergraduate/degree-program-requirements/me-minor-program/). The department will verify the completion of the minor and send the paperwork to the appropriate parties after final grades are available.

Joint Majors

The Department of Mechanical Engineering also offers two joint majors with other departments in the College of Engineering. For further information on these programs, please click the links below:
Materials Science and Engineering/Mechanical Engineering (http://guide.berkeley.edu/undergraduate/degree-programs/materials-science-engineering-mechanical-joint-major/) (Department of Materials Science and Engineering)
Mechanical Engineering/Nuclear Engineering (http://guide.berkeley.edu/undergraduate/degree-programs/mechanical-engineering-nuclear/) (Department of Nuclear Engineering)

In addition to the University, campus, and college requirements, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All technical courses taken in satisfaction of major requirements must be taken for a letter grade.
2. No more than one upper division course may be used to simultaneously fulfill requirements for a student’s major and minor programs.
3. A minimum overall grade point average (GPA) of 2.0 is required for all work undertaken at UC Berkeley.
4. A minimum GPA of 2.0 is required for all upper division technical courses taken in satisfaction of major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

For a detailed plan of study by year and semester, please see the Plan of Study tab.

Lower Division Requirements

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
CHEM 1A	General Chemistry [1]	3-5
or CHEM 4A	General Chemistry and Quantitative Analysis	
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4

ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4
ENGIN 26	Three-Dimensional Modeling for Design [2]	2
ENGIN 29	Manufacturing and Design Communication	4
MEC ENG 40	Thermodynamics	3
MEC ENG C85	Introduction to Solid Mechanics	3

1 CHEM 4A is intended for students majoring in chemistry or a closely-related field.
2 All junior transfer admits are exempt from completing ENGIN 26.

Upper Division Requirements

Students must complete the Upper Division Core Requirements and 15 units of Technical Electives.

Upper Division Core Requirements

ENGIN 178	Statistics and Data Science for Engineers	4
MEC ENG 100	Electronics for the Internet of Things	4
MEC ENG 102B	Mechatronics Design	4
MEC ENG 103	Experimentation and Measurements	4
MEC ENG 104	Engineering Mechanics II	3
MEC ENG 106	Fluid Mechanics	3
MEC ENG 108	Mechanical Behavior of Engineering Materials	4
MEC ENG 109	Heat Transfer	3
MEC ENG 132	Dynamic Systems and Feedback	3

Technical Electives (minimum 15 units) [1, 2, 3]

Students may choose to complete the **Aerospace Engineering concentration** as part of their technical electives.[4]

Select at least one course from the ME-sponsored Design Elective list, or from the expanded list linked in the footnote: [5]

ENGIN 128	Advanced Engineering Design Graphics [3] [1]
MEC ENG 101	Introduction to Lean Manufacturing Systems [3]
MEC ENG 110	Introduction to Product Development [3]
MEC ENG/ BIO ENG C117	Structural Aspects of Biomaterials [4]
MEC ENG 118	Introduction to Nanotechnology and Nanoscience [3]
MEC ENG 119	Introduction to MEMS (Microelectromechanical Systems) [3]
MEC ENG 130	Design of Planar Machinery [3]
MEC ENG 133	Mechanical Vibrations [3]
EL ENG C128/ MEC ENG C13	Feedback Control Systems [4] [6]
MEC ENG 135	Design of Microprocessor-Based Mechanical Systems [4]
MEC ENG 139	Robotic Locomotion [4] [6]
MEC ENG 146	Energy Conversion Principles [3]
MEC ENG 151	Advanced Heat Transfer [3]
MEC ENG 165	Ocean-Environment Mechanics [3]
MEC ENG C176/ BIO ENG C119	Orthopedic Biomechanics [4]
MEC ENG C178/ BIO ENG C137	Designing for the Human Body [4]
MEC ENG 179	Augmenting Human Dexterity [4]

Select at least one course from the ME-sponsored Quantitative Science Elective list or from the expanded list linked in the footnote: [7]

ENGIN 117	Methods of Engineering Analysis [3] [1]
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications [4] [1]
ENGIN 177	Advanced Programming with MATLAB [3] [1]
MEC ENG 120	Computational Biomechanics Across Multiple Scales [3]
MEC ENG 131	Vehicle Dynamics and Control [4]
MEC ENG C134/ EL ENG C128	Feedback Control Systems [4]
MEC ENG 136	Introduction to Control of Unmanned Aerial Vehicles [3]
MEC ENG 139	Robotic Locomotion [4] [6]
MEC ENG C180/ CIV ENG C133	Engineering Analysis Using the Finite Element Method [3]
MEC ENG 193B	Special Topics in Controls [1-4] [8]

1 Technical electives:15 units of technical electives are required and must be chosen from the approved technical elective list (https://me.berkeley.edu/undergraduate/technical-electives/). Courses not on this list may be approved via petition. At least 12 of the 15 units must be upper division. At least 9 of the 12 upper division units must be from MECENG-sponsored courses. Any upper division course taught by mechanical engineering faculty may be used as part of the 9 units of upper division mechanical engineering courses. In addition, ENGIN 117, ENGIN 128, ENGIN 150, and ENGIN 177 can count toward the 9 units of upper division mechanical engineering courses. Students may receive up to three units of technical elective credit for work on a research project in either MEC ENG 196 or MEC ENG H194.
2 Up to three units of technical elective credit may be lower division and may be chosen from the following approved lower division courses: ASTRON 7A, ASTRON 7B, BIO ENG 10, BIOLOGY 1A plus BIOLOGY 1AL, BIOLOGY 1B, CHEM 1B, CHEM 3A, CHEM 3B, CHEM 4B, CIV ENG 11, CIV ENG 60, CIV ENG 70, CIV ENG 93, COMPSCI C8/DATA C8/INFO C8/STAT C8, COMPSCI 61A, COMPSCI 61B, COMPSCI 61C, COMPSCI 70, DES INV 15, DES INV 90E, EECS 16B, ENGIN 11, EPS 50, INTEGBI C32, MATH 55, MAT SCI 45, MCELLBI 32, PHYSICS 7C, STAT 20, STAT 21.
3 Technical electives cannot include:

- Any course taken on a *Pass/No Pass* basis
- Any course that counts as H/SS
- Courses numbered 24, 39, 84, or 88
- Any of the following courses: BIO ENG 100, COMPSCI C79, DES INV courses (except DES INV 15, DES INV 90E, DES INV 190E), ENGIN 125, ENGIN 157AC, ENGIN 180, ENGIN 183 series, ENGIN 185, ENGIN 187, ENGIN 195 series, IND ENG 95, IND ENG

171, IND END 185, IND ENG 186, IND ENG 190 series, IND ENG 191, IND ENG 192, IND ENG 195, MEC ENG 191K.

4 The three technical electives required for the Aerospace Engineering concentration are MEC ENG 127, MEC ENG 136, and MEC ENG 163.

5 One of the upper division technical electives courses must be taken from the ME-sponsored design courses above, or from the expanded design list (https://me.berkeley.edu/undergraduate/technical-electives/#design). Note that only the design courses listed above will count toward the 9 units of ME-sponsored upper division courses.

6 MEC ENG C134/EL ENG C128 and MEC ENG 139 can be used as either the Design Elective or the Quantitative Science Elective, but not both.

7 One of the upper division technical elective courses must be taken from the ME-sponsored quantitative science (QS) courses above, or from the expanded quantitative science list (https://me.berkeley.edu/undergraduate/technical-electives/#quantsci). Note that only the quantitative science courses listed above will count toward the 9 units of ME-sponsored upper division courses.

8 MEC ENG 193B is a Special Topics course and is only approved for QS when it is offered as "Feedback Control of Legged Robots".

Minor programs are areas of concentration requiring fewer courses than an undergraduate major. These programs are optional but can provide depth and breadth to a UC Berkeley education. The College of Engineering does not offer additional time to complete a minor, but it is usually possible to finish within the allotted time with careful course planning. Students are encouraged to meet with their ESS adviser to discuss the feasibility of completing a minor program.

All the engineering departments offer minors. Students may also consider pursuing a minor in another school or college.

General Guidelines

1. All minors must be declared no later than one semester before a student's Expected Graduation Term (EGT). If the semester before EGT is fall or spring, the deadline is the last day of RRR week. If the semester before EGT is summer, the deadline is the final Friday of Summer Sessions. To declare a minor, contact the department advisor for information on requirements, and the declaration process.
2. All courses taken to fulfill the minor requirements must be taken for graded credit.
3. A minimum overall grade point average (GPA) of 3.0 and a minimum GPA of 3.0 in the prerequisite courses is required for acceptance into the minor program.
4. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
5. No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.
6. Completion of the minor program cannot delay a student's graduation.

Mechanical Engineering Minor Requirements

Code	Title	Units
Prerequisites		
PHYSICS 7A	Physics for Scientists and Engineers	4
MEC ENG 40	Thermodynamics	3
MEC ENG 104	Engineering Mechanics II	3
MEC ENG C85	Introduction to Solid Mechanics	3
Upper Division Requirements		
Select three additional upper division technical courses in mechanical engineering		

Aerospace Engineering Minor Requirements

Prerequisites		
MEC ENG C85	Introduction to Solid Mechanics	3
MEC ENG 106	Fluid Mechanics	3
MEC ENG 132	Dynamic Systems and Feedback	3
Upper Division Requirements		
MEC ENG 127	Introduction to Composite Materials	3
MEC ENG 136	Introduction to Control of Unmanned Aerial Vehicles	3
MEC ENG 163	Engineering Aerodynamics	3

Students in the College of Engineering must complete no fewer than 120 semester units with the following provisions:

1. Completion of the requirements of one engineering major program (https://engineering.berkeley.edu/students/undergraduate-guide/degree-requirements/major-programs/) of study.
2. A minimum overall grade point average of 2.00 (C average) and a minimum 2.00 grade point average in upper division technical coursework required of the major.
3. The final 30 units and two semesters must be completed in residence in the College of Engineering on the Berkeley campus.
4. All technical courses (math, science, and engineering) that can fulfill requirements for the student's major must be taken on a letter graded basis (unless they are only offered P/NP).
5. Entering freshmen are allowed a maximum of eight semesters to complete their degree requirements. Entering junior transfers are allowed five semesters to complete their degree requirements. Summer terms are optional and do not count toward the maximum. Students are responsible for planning and satisfactorily completing all graduation requirements within the maximum allowable semesters.
6. Adhere to all college policies and procedures (https://engineering.berkeley.edu/students/undergraduate-guide/policies-procedures/) as they complete degree requirements.
7. Complete the lower division program before enrolling in upper division engineering courses.

Humanities and Social Sciences (H/SS) Requirement

To promote a rich and varied educational experience outside of the technical requirements for each major, the College of Engineering has a six-course Humanities and Social Sciences breadth requirement (http://engineering.berkeley.edu/student-services/degree-requirements/humanities-and-social-sciences/), which must be completed to graduate. This requirement, built into all the engineering programs of study, includes two Reading and Composition courses (R&C), and four additional courses within which a number of specific conditions must be satisfied. See the humanities and social sciences (https://engineering.berkeley.edu/students/undergraduate-guide/degree-requirements/humanities-and-social-sciences/) section of our website for details.

Class Schedule Requirements

- Minimum units per semester: 12.0
- Maximum units per semester: 20.5
- Minimum technical courses: College of Engineering undergraduates must include at least two letter graded technical courses (of at least 3 units each) in their semester program. Every semester students are expected to make satisfactory progress in their declared major. Satisfactory progress is determined by the student's Engineering Student Services Advisor. (Note: For most majors, normal progress (https://engineering.berkeley.edu/academics/undergraduate-guide/policies-procedures/scholarship-progress/#ac12282) will require enrolling in 3-4 technical courses each semester). Students who are not in compliance with this policy by the end of the fifth week of the semester are subject to a registration block that will delay enrollment for the following semester.
- All technical courses (math, science, engineering) that satisfy requirements for the major must be taken on a letter-graded basis (unless only offered as P/NP).

Minimum Academic (Grade) Requirements

- Minimum overall and semester grade point averages of 2.00 (C average) are required of engineering undergraduates. Students will be subject to dismissal from the University if during any fall or spring semester their overall UC GPA falls below a 2.00, or their semester GPA is less than 2.00.
- Students must achieve a minimum grade point average of 2.00 (C average) in upper division technical courses required for the major curriculum each semester.
- A minimum overall grade point average of 2.00 and a minimum 2.00 grade point average in upper division technical course work required for the major are required to earn a Bachelor of Science in the College of Engineering.

Unit Requirements

To earn a Bachelor of Science in Engineering, students must complete at least 120 semester units of courses subject to certain guidelines:

- Completion of the requirements of one engineering major program (https://engineering.berkeley.edu/students/undergraduate-guide/degree-requirements/major-programs/) of study.
- A maximum of 16 units of special studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed to count towards the B.S. degree, and no more than 4 units in any single term can be counted.
- A maximum of 4 units of physical education from any school attended will count towards the 120 units.
- Passed (P) grades may account for no more than one third of the total units completed at UC Berkeley, Fall Program for Freshmen (FPF), UC Education Abroad Program (UCEAP), or UC Berkeley Washington Program (UCDC) toward the 120 overall minimum unit requirement. Transfer credit is not factored into the limit. This includes transfer units from outside of the UC system, other UC campuses, credit-bearing exams, as well as UC Berkeley Extension XB units.

Normal Progress

Students in the College of Engineering must enroll in a full-time program and make normal progress (https://engineering.berkeley.edu/students/undergraduate-guide/policies-procedures/scholarship-progress/#ac12282) each semester toward the bachelor's degree. The continued enrollment of students who fail to achieve minimum academic progress shall be subject to the approval of the dean. (Note: Students with official accommodations established by the Disabled Students' Program, with health or family issues, or with other reasons deemed appropriate by the dean may petition for an exception to normal progress rules.)

University of California Requirements

Entry Level Writing (http://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

All students who will enter the University of California as freshmen must demonstrate their command of the English language by satisfying the Entry Level Writing Requirement (ELWR). The UC Entry Level Writing Requirement website (https://admission.universityofcalifornia.edu/elwr/requirements/test-scores-grades.html) provides information on how to satisfy the requirement

American History and American Institutions (http://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

The American History and Institutions (AH&I) requirements are based on the principle that a US resident graduated from an American university should have an understanding of the history and governmental institutions of the United States.

Campus Requirement

American Cultures (http://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

The American Cultures requirement is a Berkeley campus requirement, one that all undergraduate students at Berkeley need to pass in order to graduate. You satisfy the requirement by passing, with a grade not lower than C- or P, an American Cultures course. You may take an American Cultures course any time during your undergraduate career at Berkeley. The requirement was instituted in 1991 to introduce students to the diverse cultures of the United States through a comparative framework. Courses are offered in more than fifty departments in many different disciplines at both the lower and upper division level.

For more detailed information regarding the courses listed below (e.g., elective information, GPA requirements, etc.), please see the College Requirements and Major Requirements tabs.

			Freshman
Fall	Units	Spring	Units
CHEM 1A or 4A[1]	3-5	MATH 1B	4
ENGIN 26	2	PHYSICS 7A	4
MATH 1A	4	ENGIN 7	4
Reading & Composition Part A Course[7]	4	Reading & Composition Part B Course[7]	4
	13-15		16

Sophomore	Fall Units		Spring Units
ENGIN 29	4	MATH 54	4
MATH 53	4	MEC ENG 40	3
PHYSICS 7B	4	MEC ENG C85	3
Humanities/Social Sciences course[7]		Humanities/ Social Sciences course[7]	3-4
Free Electives[8]	3		
	15		13-14

Junior	Fall Units		Spring Units
MEC ENG 104	3	MEC ENG 100	4
MEC ENG 106	3	MEC ENG 109	3
MEC ENG 108	4	ENGIN 178	4
Humanities/Social Sciences course[7]	3-4	Humanities/ Social Sciences Course[7]	3-4
Free Electives[8]	3	Free Electives[8]	2
	16-17		16-17

Senior	Fall Units		Spring Units
MEC ENG 103	4	MEC ENG 102B	4
MEC ENG 132	3	Technical Electives[3,4,5,6]	9-12
Technical Electives[3,4,5,6]	6-8	Free Electives[8]	2
Free Electives[8]	3		
	16-18		15-18

Total Units: 120-130

1 CHEM 4A is intended for students majoring in chemistry or a closely-related field.

2 All junior transfer admits are exempt from completing ENGIN 26.

3 Technical electives: 15 units of technical electives (https://me.berkeley.edu/undergraduate/technical-electives/) are required, of which at least 9 units must be upper division mechanical engineering courses. Any upper division course taught by mechanical engineering faculty may be used as part of the 9 units of upper division mechanical engineering courses. In addition, ENGIN 117, ENGIN 128, ENGIN 150, and ENGIN 177 can count toward the 9 units of upper division mechanical engineering courses. The 15 units of technical electives must include one Design Elective and one Quantitative Science Elective, each chosen from approved lists. Students may receive up to three units of technical elective credit for work on a research project in either MEC ENG 196 or MEC ENG H194.

4 Up to three units of technical elective credit may be lower division and may be chosen from the following approved lower division courses: ASTRON 7A, ASTRON 7B, BIO ENG 10, BIOLOGY 1A plus BIOLOGY 1AL, BIOLOGY 1B,CHEM 1B, CHEM 3A, CHEM 3B, CHEM 4B, CIV ENG 11, CIV ENG 60, CIV ENG 70, CIV ENG 93, COMPSCI C8/DATA C8/INFO C8/STAT C8, COMPSCI 61A, COMPSCI 61B, COMPSCI 61C, COMPSCI 70, DES INV 15, DES INV 90E, EECS 16B, ENGIN 11, EPS 50, INTEGBI C32, MATH 55, MAT SCI 45, MCELLBI 32, PHYSICS 7C, STAT 20, STAT 21.

5 Technical electives cannot include:

- Any course taken on a *Pass/No Pass* basis
- Any course that counts as H/SS
- Courses numbered 24, 39, 84, or 88
- Any of the following courses: BIO ENG 100, COMPSCI C79, DES INV courses (except DES INV 15, DES INV 90E, DES INV 190E) , ENGIN 125, ENGIN 157AC, ENGIN 180, ENGIN 183 series, ENGIN 185, ENGIN 187, ENGIN 195 series, IND ENG 95, IND ENG 171, IND ENG 185, IND ENG 186, IND ENG 190 series, IND ENG 191, IND ENG 192, IND ENG 195, MEC ENG 191AC, MEC ENG 190K, MEC ENG 191K.

6 To complete the Aerospace Engineering oncentration, students must complete MEC ENG 127, MEC ENG 136, and MEC ENG 163 as part of their technical electives.

7 The Humanities/Social Sciences (H/SS) requirement includes two approved Reading & Composition (R&C) courses and four additional approved courses, with which a number of specific conditions must be satisfied. R&C courses must be taken for a letter grade (C- or better required). The first half (R&C Part A) must be completed by the end of the freshman year; the second half (R&C Part B) must be completed by no later than the end of the sophomore year. The remaining courses may be taken at any time during the program. See engineering.berkeley.edu/hss (https://engineering.berkeley.edu/academics/undergraduate-guide/degree-requirements/humanities-and-social-sciences/) for complete details and a list of approved courses.

8 Free electives can be any technical or non-technical course, a course of your interest offered by any department at UC Berkeley. There are no restrictions.

Learning Goals for the Major

The objectives of the Mechanical Engineering undergraduate program are to produce graduates who do the following:

1. Vigorously engage in post-baccalaureate endeavors, whether in engineering graduate study, in engineering practice, or in the pursuit of other fields such as science, law, medicine, business or public policy.
2. Apply their mechanical engineering education to address the full range of technical and societal problems with creativity, imagination, confidence and responsibility.
3. Actively seek out positions of leadership within their profession and their community.
4. Serve as ambassadors for engineering by exhibiting the highest ethical and professional standards, and by communicating the importance and excitement of this dynamic field.
5. Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century.

Skills

The Department of Mechanical Engineering has adopted the ABET Outcomes as its Program Outcomes. Mechanical Engineering graduates have the following:

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments as well as to analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multi-disciplinary teams.

5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for and an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Major Maps help undergraduate students discover academic, co-curricular, and discovery opportunities at UC Berkeley based on intended major or field of interest. Developed by the Division of Undergraduate Education in collaboration with academic departments, these experience maps will help you:

- **Explore** your major and gain a better understanding of your field of study
- **Connect** with people and programs that inspire and sustain your creativity, drive, curiosity and success
- **Discover** opportunities for independent inquiry, enterprise, and creative expression
- **Engage** locally and globally to broaden your perspectives and change the world
- **Reflect** on your academic career and prepare for life after Berkeley

Use the major map below as a guide to planning your undergraduate journey and designing your own unique Berkeley experience.

View the Mechanical Engineering Major Map PDF. **(**https://ue.berkeley.edu/sites/default/files/mechanical_engineering.pdf**)**

Students in Mechanical Engineering have a number of advising options, listed in sequential order:

College of Engineering (COE)

All undergraduates have an adviser at the College referred to as the Engineering Student Services (ESS) Advisor. ESS advisers assist students in a variety of ways including course selection (primarily for freshmen, sophomores and transfer students), explaining graduation requirements and college policies, monitoring progress toward the degree, suggesting enrichment opportunities, and providing support (or referrals to campus resources) to help students reach their academic goals. They are also the first stop for students who wish to file a petition. Advising assignments are made alphabetically. Students who are unsure of who their adviser is should refer to the COE's undergraduate advising information page (http://coe.berkeley.edu/students/current-undergraduates/advising/student-affairs-advising.html).

ME Student Services Office

This office is students' primary source of department-specific administrative information.

ME Faculty Advisor

Faculty advisers for new students will be assigned by the beginning of October and a listing will be available online. Faculty are great sources for information regarding classes, research opportunities, and career planning. Furthermore, all ME students are required to see their faculty advisers (or go to drop-in advising) to get their advising codes before signing up for the next semester's courses.

Vice Chair for Undergraduate Matters

The Vice Chair handles all undergraduate student petitions and can serve as a liaison between students and their respective advisors as well as students and the ME chair. He is also responsible for the ME undergraduate curriculum and heads the Committee on Undergraduate Study.

Department Chair

In rare instances when issues cannot be resolved by the Vice Chair, the Mechanical Engineering chair may become involved.

Advising Staff and Hours

Undergraduate Student Services Adviser
Ricky Vides
rickyv72@berkeley.edu
6193 Etcheverry Hall
510-642-4094

Student Groups and Organizations

Aero-design Society of Automative Engineers (https://callink.berkeley.edu/organization/asae/) (ASAE)
American Institute of Aeronautics and Astronautics at Cal (http://aiaa.berkeley.edu/)(AIAA-Cal)
American Society of Mechanical Engineers Student Chapter (http://asme.berkeley.edu/) (ASME)
Berkeley Energy and Resources Collaborative (http://berc.berkeley.edu/) (BERC)
The Black Engineering and Science Students Association (https://callink.berkeley.edu/organization/bessa/) (BESSA)
Black Graduate Engineering and Science Students Association (https://callink.berkeley.edu/organization/gablackgraduateengineeringandscience/) (BESSA)
Berkeley Human Powered Vehicle Team (https://www.hpv.berkeley.edu/)
Design + Engineering Collaborative (http://dec.berkeley.edu/) (DEC)
Formula SAE at Berkeley (http://fsae.berkeley.edu/)
Hispanic Engineers and Scientists (http://hes.berkeley.edu/) (HES)
Korean Graduate Student Association (http://www.kgsa.net/web/) (KGSA)
Latino Association of Graduate Students in Engineering and Science (http://lagses.berkeley.edu/) (LAGSES)
Mechanical Engineering Graduate Student Council (http://best.berkeley.edu/%7Emfuge/megsco/wiki/index.php/Main_Page/) (MEGSCO)
Out in Science, Technology, Engineering, and Mathematics (http://berkeley.ostem.org/) (oSTEM)
Pi Tau Sigma (http://pts.berkeley.edu/) (The Mechanical Engineering Honor Society)
Pioneers in Engineering (https://pioneers.berkeley.edu/)
Society of Asian Scientists and Engineers (http://www.saseconnect.org/) (SASE)
Society of Naval Architects and Marine Engineers (http://www.sname.org/ucb/home/) (Cal_SNAME)
Society of Women Engineers (http://swe.berkeley.edu/) (SWE)
Space Technologies at Cal (http://stac.berkeley.edu/) (STAC)
Space Technologies and Rocketry (https://callink.berkeley.edu/organization/calSTAR/) (STAR)

Super Mileage Vehicle Team (http://smv.berkeley.edu/) (SMV)
Tau Beta Pi (https://tbp.berkeley.edu/)
UC Berkeley Solar Vehicle Team (http://calsol.berkeley.edu/) (CalSol)

Mechanical Engineering

Expand all course descriptions [+]Collapse all course descriptions [-]

MEC ENG 24 Freshman Seminars 1 Unit

Terms offered: Fall 2022, Spring 2022, Fall 2021
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Freshman Seminars: Read More [+]
Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final Exam To be decided by the instructor when the class is offered.

Freshman Seminars: Read Less [-]

MEC ENG 40 Thermodynamics 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022
This course introduces the scientific principles that deal with energy conversion among different forms, such as heat, work, internal, electrical, and chemical energy. The physical science of heat and temperature, and their relations to energy and work, are analyzed on the basis of the four fundamental thermodynamic laws (zeroth, first, second, and third). These principles are applied to various practical systems, including heat engines, refrigeration cycles, air conditioning, and chemical reacting systems.
Thermodynamics: Read More [+]
Objectives & Outcomes

Course Objectives: 2) to develop analytic ability in real-world engineering applications using thermodynamics principles.
The objectives of this course are:
1) to provide the fundamental background of thermodynamics principles, and

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: CHEM 1A, ENGIN 7, MATH 1B, and PHYSICS 7B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Thermodynamics: Read Less [-]

MEC ENG C85 Introduction to Solid Mechanics 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022
A review of equilibrium for particles and rigid bodies. Application to truss structures. The concepts of deformation, strain, and stress. Equilibrium equations for a continuum. Elements of the theory of linear elasticity. The states of plane stress and plane strain. Solution of elementary elasticity problems (beam bending, torsion of circular bars). Euler buckling in elastic beams.
Introduction to Solid Mechanics: Read More [+]
Rules & Requirements

Prerequisites: Mathematics 53 and 54 (may be taken concurrently); Physics 7A

Credit Restrictions: Students will receive no credit for Mechanical Engineering C85/Civil and Environmental Engineering C30 after completing Mechanical Engineering W85. A deficient grade in Mechanical Engineering W85 may be removed by taking Mechanical Engineering C85/Civil and Environmental Engineering C30.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer:
6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week
10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Armero, Papadopoulos, Zohdi, Johnson

Also listed as: CIV ENG C30

Introduction to Solid Mechanics: Read Less [-]

MEC ENG W85 Introduction to Solid Mechanics 3 Units

Terms offered: Summer 2021 8 Week Session, Summer 2020 8 Week Session, Summer 2019 8 Week Session
A review of equilibrium for particles and rigid bodies. Application to truss structures. The concepts of deformation, strain, and stress. Equilibrium equations for a continuum. Elements of the theory of linear elasticity. The states of plane stress and plane strain. Solution of elementary elasticity problems (beam bending, torsion of circular bars). Euler buckling in elastic beams.
Introduction to Solid Mechanics: Read More [+]
Objectives & Outcomes

Course Objectives: To learn statics and mechanics of materials

Student Learning Outcomes: -
Correctly draw free-body
-
Apply the equations of equilibrium to two and three-dimensional solids
-
Understand the concepts of stress and strain
-
Ability to calculate deflections in engineered systems
-
Solve simple boundary value problems in linear elastostatics (tension, torsion, beam bending)

Rules & Requirements

Prerequisites: MATH 53 and MATH 54 (may be taken concurrently); PHYSICS 7A

Credit Restrictions: Students will receive no credit for MEC ENG W85 after completing MEC ENG C85. A deficient grade in MEC ENG W85 may be removed by taking MEC ENG C85.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of web-based lecture and 1 hour of web-based discussion per week

Summer:
6 weeks - 7.5 hours of web-based lecture and 2.5 hours of web-based discussion per week
8 weeks - 6 hours of web-based lecture and 2 hours of web-based discussion per week
10 weeks - 4.5 hours of web-based lecture and 1.5 hours of web-based discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Govindjee

Also listed as: CIV ENG W30

Introduction to Solid Mechanics: Read Less [-]

MEC ENG 98 Supervised Independent Group Studies 1 - 4 Units

Terms offered: Spring 2022, Fall 2021, Spring 2021
Organized group study on various topics under the sponsorship and direction of a member of the Mechanical Engineering faculty.
Supervised Independent Group Studies: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Summer: 10 weeks - 1.5-6 hours of directed group study per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Group Studies: Read Less [-]

MEC ENG 100 Electronics for the Internet of Things 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
Electronics and Electrical Engineering has become pervasive in our lives as a powerful technology with applications in a wide range of fields including healthcare, environmental monitoring, robotics, or entertainment. This course offers a broad survey of Electrical Engineering ideas to non-majors. In the laboratory students will learn in-depth how to design and build systems that exchange information with or are controlled from the cloud. Examples include solar harvesters, robots, and smart home devices. In the course project, the students will integrate what they have learned and build an Internet-of-Things application of their choice. The course has a mandatory lab fee.
Electronics for the Internet of Things: Read More [+]
Objectives & Outcomes

Course Objectives: Electronics has become a powerful and ubiquitous technology supporting solutions to a wide range of applications in fields ranging from science, engineering, healthcare, environmental monitoring, transportation, to entertainment. This course teaches students majoring in these and related subjects how to use electronic devices to solve problems in their areas of expertise. Through the lecture and laboratory, students gain insight into the possibilities and limitations of the technology and how to use electronics to help solve problems. Students learn to use electronics to interact with the environment through sound, light, temperature, motion using sensors and actuators, and how to use electronic computation to orchestrate the interactions and exchange information wirelessly over the internet.
The course has two objectives: (a) to teach students how to build electronic circuits that interact with the environment through sensors and actuators and how to communicate wirelessly with the internet to cooperate with other devices and with humans, and (b) to offer a broad survey of modern Electrical Engineering including analog electronics: analysis of RLC circuits, filtering, diodes and rectifiers, op-amps, A2D and D2A converters; digital electronics: combinatorial and sequential logic, flip-flops, counters, memory; applications: communication systems, signal processing, computer architecture; basics of manufacturing of integrated circuits.

Student Learning Outcomes: an ability to communicate effectively
an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
an ability to identify, formulate, and solve engineering problems
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: ENGIN 7, COMPSCI 10, COMPSCI 61A, COMPSCI C8, or equivalent background in computer programing; MATH 1A or equivalent background in calculus; PHYSICS 7A or equivalent background in physics

Credit Restrictions: Student will not receive credit for this course if they have taken EE49

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 2 hours of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

MEC ENG 101 Introduction to Lean Manufacturing Systems 3 Units

Terms offered: Spring 2021, Spring 2019, Spring 2018
Fundamentals of lean manufacturing systems including manufacturing fundamentals, unit operations and manufacturing line considerations for work in process (WIP), manufacturing lead time (MLT), economics, quality monitoring; high mix/low volume (HMLV) systems fundamentals including just in time (JIT), kanban, buffers and line balancing; class project/case studies for design and analysis of competitive manufacturing systems.
Introduction to Lean Manufacturing Systems: Read More [+]
Objectives & Outcomes

Course Objectives: This course will enable students to analyze manufacturing lines in order to understand the production process and improve production efficiency. The course provides practical knowledge and skills that can be applied in industry, covering the complete manufacturing system from production planning to quality control. Students are given a chance to practice and implement what they learn during lectures by conducting projects with local or global manufacturing companies.

Student Learning Outcomes: Students will understand the whole scope of manufacturing systems from production planning to quality control, which can be helpful to set up manufacturing lines for various products. Students will be capable of identifying sources of manufacturing problems by analyzing the production line and produce multi-level solutions to optimize manufacturing efficiency.

Rules & Requirements

Prerequisites: Completion of all lower division requirements for an engineering major, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 6 weeks - 7.5 hours of lecture and 3 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Dornfeld, McMains

Introduction to Lean Manufacturing Systems: Read Less [-]

MEC ENG 102B Mechatronics Design 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
Introduction to design and realization of mechatronics systems. Micro computer architectures. Basic computer IO devices. Embedded microprocessor systems and control, IO programming such as analogue to digital converters, PWM, serial and parallel outputs. Electrical components such as power supplies, operational amplifiers, transformers and filters. Shielding and grounding. Design of electric, hydraulic and pneumatic actuators. Design of sensors. Design of power transmission systems. Kinematics and dynamics of robotics devices. Basic feedback design to create robustness and performance.
Mechatronics Design: Read More [+]
Objectives & Outcomes

Course Objectives: Introduce students to design and design techniques of mechatronics systems; provide guidelines to and experience with design of variety of sensors and actuators; design experience in programming microcomputers and various IO devices; exposure to and design experience in synthesis of mechanical power transfer components; understanding the role of dynamics and kinematics of robotic devices in design of mechatronics systems; exposure to and design experience in synthesis of feedback systems; provide experience in working in a team to design a prototype mechatronics device.

Student Learning Outcomes: By the end of this course, students should: Know how to set up micro computers and interface them with various devices; know how to understand the microcomputers architectures, IO devices and be able to program them effectively; understand the design of actuators and sensors; know how to do shielding and grounding for various mechatronics projects, know how to create feedback systems, know the role of dynamics and kinematics of robotic devices in design and control of mechatronics systems; know how to design mechanical components such as transmissions, bearings, shafts, and fasteners.

Rules & Requirements

Prerequisites: ENGIN 25, ENGIN 26, ENGIN 27; and EECS 16A or MEC ENG 100. Please note that junior transfer students are exempt from ENGIN 26

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Mechatronics Design: Read Less [-]

MEC ENG 103 Experimentation and Measurements 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
This course introduces students to modern experimental techniques for mechanical engineering, and improves students' teamwork and communication skills. Students will work in a laboratory setting on systems ranging in complexity from desktop experiments with only a few instruments up to systems such as an internal combustion engine with a wide variety of sensors. State-of-the-art software for data acquisition and analysis will be introduced and used throughout the course. The role of error and uncertainty, and uncertainty propagation, in measurements and analysis will be examined. Design of experiments will be addressed through examples and homework. The role and limitations of spectral analysis of digital data will be discussed.
Experimentation and Measurements: Read More [+]
Objectives & Outcomes

Course Objectives: Introduce students to modern experimental techniques for mechanical engineering; provide exposure to and experience with a variety of sensors, including those to measure temperature, displacement, velocity, acceleration and strain; examine the role of error and uncertainty in measurements and analysis; exposure to and experience in using commercial software for data acquisition and analysis; discuss the role and limitations of spectral analysis of digital data; provide experience in working in a team in all aspects of the laboratory exercises, including set-up, data collection, analysis, technical report writing and oral presentation.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to function on multi-disciplinary teams
(d) an ability to identify, formulate, and solve engineering problems
(e) an understanding of professional and ethical responsibility
(f) an ability to communicate effectively
(g) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(h) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(i) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG 40; MEC ENG C85 / CIV ENG C30; MEC ENG 100; MEC ENG 106 (can be taken concurrently), and MEC ENG 109 (can be taken concurrently)

Credit Restrictions: Students will not receive credit for this course if they have taken both ME 102A and ME 107.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructors: Johnson, Makiharju, Chen

Experimentation and Measurements: Read Less [-]

MEC ENG 104 Engineering Mechanics II 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022
This course is an introduction to the dynamics of particles and rigid bodies. The material, based on a Newtonian formulation of the governing equations, is illustrated with numerous examples ranging from one-dimensional motion of a single particle to planar motions of rigid bodies and systems of rigid bodies.
Engineering Mechanics II: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG C85 and ENGIN 7

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Ma

Engineering Mechanics II: Read Less [-]

MEC ENG 106 Fluid Mechanics 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Spring 2022
This course introduces the fundamentals and techniques of fluid mechanics with the aim of describing and controlling engineering flows.
Fluid Mechanics: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30 and MEC ENG 104 (104 may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Fluid Mechanics: Read Less [-]

MEC ENG C106A Introduction to Robotics 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020, Fall 2019
This course is an introduction to the field of robotics. It covers the fundamentals of kinematics, dynamics, control of robot manipulators, robotic vision, sensing, forward & inverse kinematics of serial chain manipulators, the manipulator Jacobian, force relations, dynamics, & control. We will present techniques for geometric motion planning & obstacle avoidance. Open problems in trajectory generation with dynamic constraints will also be discussed. The course also presents the use of the same analytical techniques as manipulation for the analysis of images & computer vision. Low level vision, structure from motion, & an introduction to vision & learning will be covered. The course concludes with current applications of robotics.
Introduction to Robotics: Read More [+]
Rules & Requirements

Prerequisites: Familiarity with linear algebra at the level of EECS 16A/ EECS 16B or Math 54. Experience coding in python at the level of COMPSCI 61A. Preferred: experience developing software at the level of COMPSCI 61B and experience using Linux

Credit Restrictions: Students will receive no credit for Electrical Engineering and Computer Science C106A/Bioengineering C106A after completing EE C106A/BioE C125, Electrical Engineering 206A, or Electrical Engineering and Computer Science 206A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week

Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Sastry

Also listed as: BIO ENG C106A/EECS C106A

Introduction to Robotics: Read Less [-]

MEC ENG C106B Robotic Manipulation and Interaction 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020, Spring 2019
The course is a sequel to EECS/BIOE/MEC106A/EECSC206A, which covers the mathematical fundamentals of robotics including kinematics, dynamics and control as well as an introduction to path planning, obstacle avoidance, and computer vision. This course will present several areas of robotics and active vision, at a deeper level and informed by current research. Concepts will include the review at an advanced level of robot control, the kinematics, dynamics and control of multi-fingered hands, grasping and manipulation of objects, mobile robots: including non-holonomic motion planning and control, path planning, Simultaneous Localization And Mapping (SLAM), and active vision. Additional research topics covered at the instructor's discretion.
Robotic Manipulation and Interaction: Read More [+]
Rules & Requirements

Prerequisites: EECS C106A / BIO ENG C106A / MEC ENG C106A / EECS C206A or an equivalent course. A strong programming background, knowledge of Python and Matlab, and some coursework in feedback controls (such as EL ENG C128 / MEC ENG C134) are also useful. Students who have not taken the prerequisite course should have a strong programming background, knowledge of Python and Matlab, and exposure to linear algebra, Lagrangian dynamics, and feedback controls at the intermediate level. EECS C106A

Credit Restrictions: Students will receive no credit for Electrical Engineering and Computer Science C106B/Bioengineering C106B after completing Electrical Engineering C106B/Bioengineering C125B, Electrical Engineering 206B, or Electrical Engineering and Computer Science 206B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Sastry

Also listed as: BIO ENG C106B/EECS C106B

Robotic Manipulation and Interaction: Read Less [-]

MEC ENG 108 Mechanical Behavior of Engineering Materials 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
This course covers elastic and plastic deformation under static and dynamic loads. Failure by yielding, fracture, fatigue, wear, and environmental factors are also examined. Topics include engineering materials, heat treatment, structure-property relationships, elastic deformation and multiaxial loading, plastic deformation and yield criteria, dislocation plasticity and strengthening mechanisms, creep, stress concentration effects, fracture, fatigue, and contact deformation.
Mechanical Behavior of Engineering Materials: Read More [+]
Objectives & Outcomes

Course Objectives: The central theme of this course is the mechanical behavior of engineering materials, such as metals, ceramics, polymers, and composites, subjected to different types of loading. The main objectives are to provide students with basic understanding of phase transformation by heat treating and stress-induced hardening, linear and nonlinear elastic behavior, deformation under multiaxial loading, plastic deformation and yield criteria, dislocation plasticity and strengthening mechanisms, creep, stress concentration effects, brittle versus ductile fracture, fracture mechanisms at different scales, fatigue, contact deformation, and wear.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) an ability to identify, formulate, and solve engineering problems
(i) a recognition of the need for, and an ability to engage in life-long learning
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Komvopoulos, Grace O'Connell

Mechanical Behavior of Engineering Materials: Read Less [-]

MEC ENG 109 Heat Transfer 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021
This course covers transport processes of mass, momentum, and energy from a macroscopic view with emphasis both on understanding why matter behaves as it does and on developing practical problem solving skills. The course is divided into four parts: introduction, conduction, convection, and radiation.
Heat Transfer: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 40 and MEC ENG 106

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer:
8 weeks - 5.5 hours of lecture and 1.5 hours of discussion per week
10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Heat Transfer: Read Less [-]

MEC ENG 110 Introduction to Product Development 3 Units

Terms offered: Summer 2022 10 Week Session, Spring 2022, Summer 2021 10 Week Session
The course provides project-based learning experience in innovative new product development, with a focus on mechanical engineering systems. Design concepts and techniques are introduced, and the student's design ability is developed in a design or feasibility study chosen to emphasize ingenuity and provide wide coverage of engineering topics. Relevant software will be integrated into studio sessions, including solid modeling and environmental life cycle analysis. Design optimization and social, economic, and political implications are included.
Introduction to Product Development: Read More [+]
Rules & Requirements

Prerequisites: Junior or higher standing

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 0-1 hours of voluntary per week

Summer: 10 weeks - 4.5-4.5 hours of lecture and 0-1 hours of voluntary per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Introduction to Product Development: Read Less [-]

MEC ENG C115 Molecular Biomechanics and Mechanobiology of the Cell 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020, Spring 2019
This course applies methods of statistical continuum mechanics to subcellar biomechanical phenomena ranging from nanoscale (molecular) to microscale (whole cell and cell population) biological processes at the interface of mechanics, biology, and chemistry.
Molecular Biomechanics and Mechanobiology of the Cell: Read More [+]
Objectives & Outcomes

Course Objectives: This course, which is open to senior undergraduate students or graduate students in diverse disciplines ranging from engineering to biology to chemistry and physics, is aimed at exposing students to subcellular biomechanical phenomena spanning scales from molecules to the whole cell.

Student Learning Outcomes: The students will develop tools and skills to (1) understand and analyze subcelluar biomechanics and transport phenomena, and (2) ultimately apply these skills to novel biological and biomedical applications

Rules & Requirements

Prerequisites: BIO ENG 102; or MEC ENG C85 / CIV ENG C30; or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Mofrad

Also listed as: BIO ENG C112

Molecular Biomechanics and Mechanobiology of the Cell: Read Less [-]

MEC ENG C117 Structural Aspects of Biomaterials 4 Units

Terms offered: Fall 2020, Spring 2019, Spring 2018
This course covers the structure and mechanical functions of load bearing tissues and their replacements. Natural and synthetic load-bearing biomaterials for clinical applications are reviewed. Biocompatibility of biomaterials and host response to structural implants are examined. Quantitative treatment of biomechanical issues and constitutive relationships of tissues are covered in order to design biomaterial replacements for structural function. Material selection for load bearing applications including reconstructive surgery, orthopedics, dentistry, and cardiology are addressed. Mechanical design for longevity including topics of fatigue, wear, and fracture are reviewed. Case studies that examine failures of devices are presented.
Structural Aspects of Biomaterials: Read More [+]
Rules & Requirements

Prerequisites: BIOLOGY 1A and MAT SCI 45; CIV ENG 130, CIV ENG 130N, or BIO ENG 102

Credit Restrictions: Students will receive no credit for Mechanical Engineering C117 after completing Mechanical Engineering C215/ Bioengineering C222.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Pruitt

Also listed as: BIO ENG C117

Structural Aspects of Biomaterials: Read Less [-]

MEC ENG 118 Introduction to Nanotechnology and Nanoscience 3 Units

Terms offered: Spring 2021, Spring 2020, Spring 2017
This course introduces engineering students (juniors and seniors) to the field of nanotechnology and nanoscience. The course has two components: (1) Formal lectures. Students receive a set of formal lectures introducing them to the field of nanotechnology and nanoscience. The material covered includes nanofabrication technology (how one achieves the nanometer length scale, from "bottom up" to "top down" technologies), the interdisciplinary nature of nanotechnology and nanoscience (including areas of chemistry, material science, physics, and molecular biology), examples of nanoscience phenomena (the crossover from bulk to quantum mechanical properties), and applications (from integrated circuits, quantum computing, MEMS, and bioengineering).
(2) Projects. Students are asked to read and present a variety of current journal papers to the class and lead a discussion on the various works.
Introduction to Nanotechnology and Nanoscience: Read More [+]
Rules & Requirements

Prerequisites: Chemistry 1A and Physics 7B. Physics 7C and Engineering 45 (or the equivalent) recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Lin, Sohn

Introduction to Nanotechnology and Nanoscience: Read Less [-]

MEC ENG 119 Introduction to MEMS (Microelectromechanical Systems) 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Fundamentals of microelectromechanical systems including design, fabrication of microstructures; surface-micromachining, bulk-micromachining, LIGA, and other micro machining processes; fabrication principles of integrated circuit device and their applications for making MEMS devices; high-aspect-ratio microstructures; scaling issues in the micro scale (heat transfer, fluid mechanics and solid mechanics); device design, analysis, and mask layout.
Introduction to MEMS (Microelectromechanical Systems): Read More [+]
Rules & Requirements

Prerequisites: PHYSICS 7B and MEC ENG 100

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Introduction to MEMS (Microelectromechanical Systems): Read Less [-]

MEC ENG 120 Computational Biomechanics Across Multiple Scales 3 Units

Terms offered: Fall 2016, Spring 2015, Spring 2014
This course applies the methods of computational modeling and continuum mechanics to biomedical phenomena spanning various length scales ranging from molecular to cellular to tissue and organ levels. The course is intended for upper level undergraduate students who have been exposed to undergraduate continuum mechanics (statics and strength of materials.)
Computational Biomechanics Across Multiple Scales: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Mofrad

Computational Biomechanics Across Multiple Scales: Read Less [-]

MEC ENG 122 Processing of Materials in Manufacturing 3 Units

Terms offered: Spring 2020, Spring 2018, Spring 2017
Fundamentals of manufacturing processes (metal forming, forging, metal cutting, welding, joining, and casting); selection of metals, plastics, and other materials relative to the design and choice of manufacturing processes; geometric dimensioning and tolerancing of all processes.
Processing of Materials in Manufacturing: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30 and MEC ENG 108

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Processing of Materials in Manufacturing: Read Less [-]

MEC ENG 125 Industry-Associated Capstones in Mechanical Engineering (iACME) 4 Units

Terms offered: Spring 2018

iACME provide opportunities for Mechanical Engineering undergraduates to tackle real-world engineering problems. Student teams, consisting of no more than four students, will apply to work on specific industry-initiated projects. Teams will be selected based on prior experience in research/internships, scholastic achievements in ME courses, and most importantly, proposed initial approaches toward tackling the specific project. ME faculty, alumni of the Mechanical Engineering Department, and industry participants will mentor selected teams. Projects fall within a wide range of mechanical engineering disciplines, e.g. biomedical, automotive/transportation, energy, design, etc.

Industry-Associated Capstones in Mechanical Engineering (iACME): Read More [+]

Objectives & Outcomes

Course Objectives: The purpose of this course is to:

- learn the fundamental concepts of approaching practical engineering problems;
- enhance skills in communication with clients and other engineers;
- enhance skills in design, prototyping, testing, and analysis.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: Senior standing and a minimum GPA of 3.0

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

Instructors: O'Connell , Sohn

Industry-Associated Capstones in Mechanical Engineering (iACME): Read Less [-]

MEC ENG 126 The Science and Engineering of Cooking 4 Units

Terms offered: Fall 2022, Spring 2022

This course will discuss concepts from the physical sciences and engineering (e.g. heat and mass transfer, phase transitions, fluid mechanics, etc.) that serve as a foundation for everyday cooking and haute cuisine. The course will integrate the expertise of visiting chefs from the Bay Area (and beyond) who will serve as guest lecturers and present their cooking techniques. These unique opportunities will be complemented by lectures that investigate in-depth the science and engineering that underlie these techniques.

The Science and Engineering of Cooking: Read More [+]

Rules & Requirements

Prerequisites: PHYSICS 7A, CHEM 1A, or consent of instructor. MEC ENG 109 and MEC ENG 108 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Sohn

The Science and Engineering of Cooking: Read Less [-]

MEC ENG 127 Introduction to Composite Materials 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2011
Imagine a material that offers mechanical properties that are competitive with aluminum and steel but are at fractions of their weight – these materials are termed as composites. Composite materials are used for many applications such as aircraft structures, biomedical devices, racing car bodies, and many others for their capability to be stronger, lighter, and cheaper when compared to traditional materials. In this class, students will delve into the theory to design composite structures, processing techniques to manufacture them, and structural testing methods for validation. Starting from traditional fiber-reinforced composite materials, this course will also bring in new concepts such as nanocomposites and bioinspired composites.
Introduction to Composite Materials: Read More [+]
Objectives & Outcomes

Course Objectives: The course objectives are to train students to be able to design composite structures, select composite materials, conduct stress analyses of selected practical applications using laminated plate theories and appropriate strength criteria, and be familiar with the properties and response of composite structures subjected to mechanical loading under static and cyclic conditions.

Student Learning Outcomes: A knowledge of contemporary issues.
An ability to design and conduct experiments, as well as to analyze and interpret data.
An understanding of professional and ethical responsibility.
The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
A recognition of the need for, and an ability to engage in life-long learning.
An ability to apply knowledge of mathematics, science, and engineering.
An ability to communicate effectively.
An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

An ability to function on multi-disciplinary teams.
An ability to identify, formulate, and solve engineering problems.
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Students completing this course will have the facility for designing robust composite structures subjected to various types of loads. Students will also be able to assess the effects of long-term loading, including damage generation, delamination fracture and fatigue failure. Additionally, students will be exposed to how composites are used in various applications in aerospace, biomedical, sports, among other fields.

Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30

Credit Restrictions: Students will receive no credit for MEC ENG 127 after completing MEC ENG 127. A deficient grade in MEC ENG 127 may be removed by taking MEC ENG 127.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

MEC ENG 130 Design of Planar Machinery 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Synthesis, analysis, and design of planar machines. Kinematic structure, graphical, analytical, and numerical analysis and synthesis. Linkages, cams, reciprocating engines, gear trains, and flywheels.
Design of Planar Machinery: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Youssefi

Design of Planar Machinery: Read Less [-]

MEC ENG 131 Vehicle Dynamics and Control 4 Units

Terms offered: Spring 2021, Spring 2020, Spring 2019
Physical understanding of automotive vehicle dynamics including simple lateral, longitudinal and ride quality models. An overview of active safety systems will be introduced including the basic concepts and terminology, the state-of-the-art development, and basic principles of systems such as ABS, traction control, dynamic stability control, and roll stability control. Passive, semi-active and active suspension systems will be analyzed. Concepts of autonomous vehicle technology including drive-by-wire and steer-by-wire systems, adaptive cruise control and lane keeping systems. Design of software control systems for an actual 1/10 scale race vehicle.
Vehicle Dynamics and Control: Read More [+]

Objectives & Outcomes

Course Objectives: At the end of the course the students should be able to:
a.
Formulate simple but accurate dynamic models for automotive longitudinal, lateral and ride quality analysis.
b.
Assess the stability of dynamic systems using differential equation theory, apply frequency-response methods to assess system response to external disturbances, sensor noise and parameter variations.
c.
Have a basic understanding of modern automotive safety systems including ABS, traction control, dynamic stability control and roll control.
d.
Follow the literature on these subjects and perform independent design, research and development work in this field.
e.
Expected to design feedback control systems for an actual 1/010 scaled vehicle platform which will be distributed to every group of two students in the class

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(g) an ability to communicate effectively
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MATH 1B, MATH 53, MATH 54, PHYSICS 7A, PHYSICS 7B, ENGIN 7 (or alternate programming course), and MEC ENG 132

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Borrelli

MEC ENG 132 Dynamic Systems and Feedback 3 Units

Terms offered: Fall 2022, Summer 2022 10 Week Session, Fall 2021
Physical understanding of dynamics and feedback. Linear feedback control of dynamic systems. Mathematical tools for analysis and design. Stability. Modeling systems with differential equations. Linearization. Solution to linear, time-invariant differential equations.
Dynamic Systems and Feedback: Read More [+]

Rules & Requirements

Prerequisites: MATH 53, MATH 54, PHYSICS 7A, and PHYSICS 7B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Dynamic Systems and Feedback: Read Less [-]

MEC ENG 133 Mechanical Vibrations 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
An introduction to the theory of mechanical vibrations including topics of harmonic motion, resonance, transient and random excitation, applications of Fourier analysis and convolution methods. Multidegree of freedom discrete systems including principal mode, principal coordinates and Rayleigh's principle.
Mechanical Vibrations: Read More [+]
Objectives & Outcomes

Course Objectives: Introduce basic aspects of vibrational analysis, considering both single and multi-degree-of-freedom systems. Discuss the use of exact and approximate methods in the analysis of complex systems. Familiarize students with the use of MATLAB as directed toward vibration problems.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Upon completion of the course students shall be able to: Derive the equations of motion for vibratory systems. Linearize nonlinear systems so as to allow a linear vibrational analysis. Compute the natural frequency (or frequencies) of vibratory systems and determine the system's modal response. Determine the overall response based upon the initial conditions and/or steady forcing input. Design a passive vibration absorber to ameliorate vibrations in a forced system.

Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 10 weeks - 5 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Mechanical Vibrations: Read Less [-]

MEC ENG C134 Feedback Control Systems 4 Units

Terms offered: Spring 2022, Fall 2021, Spring 2021, Fall 2020
Analysis and synthesis of linear feedback control systems in transform and time domains. Control system design by root locus, frequency response, and state space methods. Applications to electro-mechanical and mechatronics systems.
Feedback Control Systems: Read More [+]
Rules & Requirements

Prerequisites: EECS 16A or MEC ENG 100; MEC ENG 132 or EL ENG 120

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Also listed as: EL ENG C128

Feedback Control Systems: Read Less [-]

MEC ENG 135 Design of Microprocessor-Based Mechanical Systems 4 Units

Terms offered: Spring 2022, Spring 2020, Spring 2019
This course provides preparation for the conceptual design and prototyping of mechanical systems that use microprocessors to control machine activities, acquire and analyze data, and interact with operators. The architecture of microprocessors is related to problems in mechanical systems through study of systems, including electro-mechanical components, thermal components and a variety of instruments. Laboratory exercises lead through studies of different levels of software.
Design of Microprocessor-Based Mechanical Systems: Read More [+]
Rules & Requirements

Prerequisites: ENGIN 7

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

Summer: 10 weeks - 4.5 hours of lecture and 4.5 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Kazerooni

Design of Microprocessor-Based Mechanical Systems: Read Less [-]

MEC ENG 136 Introduction to Control of Unmanned Aerial Vehicles 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
This course introduces students to the control of unmanned aerial vehicles (UAVs). The course will cover modeling and dynamics of aerial vehicles, and common control strategies. Laboratory exercises allow students to apply knowledge on a real system, by programming a microcontroller to control a UAV.
Introduction to Control of Unmanned Aerial Vehicles: Read More [+]
Objectives & Outcomes

Course Objectives: Introduce the students to analysis, modeling, and control of unmanned aerial vehicles. Lectures will cover:
•
Principle forces acting on a UAV, including aerodynamics of propellers
•
The kinematics and dynamics of rotations, and 3D modeling of vehicle dynamics
•
Typical sensors, and their modeling
•
Typical control strategies, and their pitfalls
•
Programming a microcontroller
During the laboratory sessions, students will apply these skills to create a model-based controller for a UAV.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(g) an ability to communicate effectively
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Rules & Requirements

Prerequisites: MEC ENG 104 is recommended. Corequisite: MEC ENG 132

Credit Restrictions: Student will not receive credit for this course if they have taken Mechanical Engineering 236U.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Mueller

Introduction to Control of Unmanned Aerial Vehicles: Read Less [-]

MEC ENG 136HL Intro to Control of Unmanned Aerial Vehicles Hardware Laboratory 1 Unit

Terms offered: Not yet offered
This course complements ME136, Introduction to Control of Unmanned Aerial Vehicles. The aim is to provide hardware experiments corresponding to the virtual lab exercises provided in ME136. Students will work in teams. This is a room share with the graduate-level ME 236 HL
Intro to Control of Unmanned Aerial Vehicles Hardware Laboratory: Read More [+]
Objectives & Outcomes

Course Objectives: •
Evaluating data from real experiments, with corresponding issues.
•
Experimental flight hardware.
•
Real noisy sensors.
• Embedded programming and constraints following there from

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering.
(b) an ability to design and conduct experiments, as well as to analyze and interpret data.
(g) an ability to communicate effectively.
(k) an ability to use the techniques, skills, and modern engineering tools for necessary engineering practice.

Rules & Requirements

Prerequisites: MECENG 136 (corequisite)

Hours & Format

Fall and/or spring: 6 weeks - 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Mueller

Intro to Control of Unmanned Aerial Vehicles Hardware Laboratory: Read Less [-]

MEC ENG 138 Introduction to Micro/Nano Mechanical Systems Laboratory 3 Units

Terms offered: Spring 2018, Spring 2015, Spring 2013
This hands-on laboratory course focuses on the mechanical engineering principles that underlie the design, fabricaton, and operation of micro/nanoscale mechanical systems, including devices made by nanowire/nanotube syntheses; photolithography/soft lithography; and molding processes. Each laboratory will have different focuses for basic understanding of MEMS/NEMS systems from prototype constructions to experimental testings using mechanical, electrical, or optical techniques.
Introduction to Micro/Nano Mechanical Systems Laboratory: Read More [+]

Rules & Requirements

Prerequisites: PHYSICS 7B and MEC ENG 106; EECS 16A or MEC ENG 100. MEC ENG 118 or MEC ENG 119 are highly recommended but not mandatory

Credit Restrictions: Students will receive no credit for Mechanical Engineering 238 after taking Mechanical Engineering 138.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Introduction to Micro/Nano Mechanical Systems Laboratory: Read Less [-]

MEC ENG 139 Robotic Locomotion 4 Units

Terms offered: Fall 2022, Fall 2021
This course provides students with a basic understanding of robotic locomotion and the use of kinematics, dynamics, control algorithms, embedded microcomputers and mechanical components in designing artificial legs such as prosthetics, orthotics and exoskeletons.
Robotic Locomotion: Read More [+]

Objectives & Outcomes

Course Objectives: Conduct various analyses on the legs' performance, propose and study practical applications
such as orthotics and prosthetics in medical field, back support, knee support and shoulder support
exoskeletons in industrial field and recreational exoskeletons.
The course objectives are to train students to be able to design artificial legs, select and design components of
the robotic legs.

Student Learning Outcomes: (a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such
as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic,
environmental, and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: A preliminary course in the design and control of mechanical systems

Credit Restrictions: Students will receive no credit for MEC ENG 139 after completing MEC ENG 239. A deficient grade in MEC ENG 139 may be removed by taking MEC ENG 239.

Hours & Format

Fall and/or spring:
15 weeks - 3 hours of lecture and 3 hours of laboratory per week
15 weeks - 3 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kazerooni

Robotic Locomotion: Read Less [-]

MEC ENG 140 Combustion Processes 3 Units

Terms offered: Fall 2020, Fall 2019, Fall 2018
Fundamentals of combustion, flame structure, flame speed, flammability, ignition, stirred reaction, kinetics and nonequilibrium processes, pollutant formation. Application to engines, energy production and fire safety.
Combustion Processes: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 40, MEC ENG 106, and MEC ENG 109 (106 and 109 may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Fernandez-Pello, Chen

Combustion Processes: Read Less [-]

MEC ENG 146 Energy Conversion Principles 3 Units

Terms offered: Fall 2018, Spring 2018, Fall 2016
This course covers the fundamental principles of energy conversion processes, followed by development of theoretical and computational tools that can be used to analyze energy conversion processes. The course also introduces the use of modern computational methods to model energy conversion performance characteristics of devices and systems. Performance features, sources of inefficiencies, and optimal design strategies are explored for a variety of applications, which may include conventional combustion based and Rankine power systems, energy systems for space applications, solar, wind, wave, thermoelectric, and geothermal energy systems.
Energy Conversion Principles: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 40, MEC ENG 106, and MEC ENG 109 (106 and 109 may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Carey

Energy Conversion Principles: Read Less [-]

MEC ENG 150A Solar-Powered Vehicles: Analysis, Design and Fabrication 3 Units

Terms offered: Summer 2015 10 Week Session, Summer 2014 10 Week Session, Spring 2014
This course addresses all aspects of design, analysis, construction and economics of solar-powered vehicles. It begins with an examination of the fundamentals of photovoltaic solar power generation, and the capabilities and limitations that exist when using this form of renewable energy. The efficiency of energy conversion and storage will be evaluated across an entire system, from the solar energy that is available to the mechanical power that is ultimately produced. The structural and dynamic stability, as well as the aerodynamics, of vehicles will be studied. Safety and economic concerns will also be considered. Students will work in teams to design, build and test a functioning single-person vehicle capable of street use.
Solar-Powered Vehicles: Analysis, Design and Fabrication: Read More [+]
Objectives & Outcomes

Course Objectives: This course provides a structured environment within which students can participate in a substantial engineering project from start to finish. It provides the opportunity for students to engage deeply in the analysis, design and construction of a functioning vehicle powered by a renewable source. Through participation in this course, students should strengthen their understanding of how their engineering education can be used to address the multidisciplinary problems with creativity, imagination, confidence and responsibility. Students will recognize the importance of effective communication in effectively addressing such problems.

Student Learning Outcomes: This course will strengthen students' abilities: to apply knowledge of mathematics, science, and engineering to real projects; to design a component or process that is part of a larger system; to function on multi-disciplinary teams; to identify, formulate, and solve engineering problems; to communicate effectively; to understand the impact of engineering solutions in a context beyond the classroom; to appreciate the importance of engaging in life-long learning and understanding contemporary issues; and to recognize and use the techniques, skills, and modern engineering tools necessary for successful project completion.

Rules & Requirements

Prerequisites: MATH 54, PHYSICS 7A, and upper division status in engineering

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

Summer: 10 weeks - 3 hours of lecture and 4.5 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Solar-Powered Vehicles: Analysis, Design and Fabrication: Read Less [-]

MEC ENG 151 Advanced Heat Transfer 3 Units

Terms offered: Spring 2017, Spring 2014, Spring 2008
Basic principles of heat transfer and their application. Subject areas include steady-state and transient system analyses for conduction, free and forced convection, boiling, condensation and thermal radiation.
Advanced Heat Transfer: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 40, MEC ENG 106, and MEC ENG 109 (106 and 109 may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Advanced Heat Transfer: Read Less [-]

MEC ENG 151A Conductive and Radiative Transport 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Fundamentals of conductive heat transfer. Analytical and numerical methods for heat conduction in rigid media. Fundamentals of radiative transfer. Radiative properties of solids, liquids and gas media. Radiative transport modeling in enclosures and participating media.
Conductive and Radiative Transport: Read More [+]
Objectives & Outcomes

Course Objectives: The course will provide students with knowledge of the physics of conductive transport in solids, the analysis of steady and transient heat conduction by both analytical and numerical methods and the treatment of phase change problems. Furthermore, the course will provide students with knowledge of radiative properties, the mechanisms of radiative transfer and will present theory and methods of solution of radiative transfer problems in participating and nonparticipating media.

Student Learning Outcomes: Students will gain knowledge of the mechanisms of conductive transfer and will develop the ability to quantify steady and transient temperature in important engineering problems often encountered (e.g. manufacturing, materials processing, bio-thermal treatment and electronics cooling) by applying analytical methods and by constructing numerical algorithms. Students will also gain knowledge of the fundamental radiative properties and the mechanisms of radiative transport in enclosures, absorbing, emitting and scattering media as well as the interaction of thermal radiation with other modes of heat transfer.

Rules & Requirements

Prerequisites: Undergraduate courses in engineering thermodynamics, fluid dynamics and heat transfer (MEC ENG 40, MEC ENG 106, and MEC ENG 109). Each student must have access to a PC, Macintosh or workstation machine with scientific programming capabilities for use in homework and projects

Credit Restrictions: Students who have taken ME 151 or ME 250A will not receive credit.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Grigoropoulos

Conductive and Radiative Transport: Read Less [-]

MEC ENG 151B Convective Transport and Computational Methods 3 Units

Terms offered: Spring 2020, Spring 2019
The transport of heat and mass in fluids in motion; free and forced convection in laminar and turbulent flow over surfaces and within ducts. Fundamentals of computational methods used for solving the governing transport equations will also be covered.
Convective Transport and Computational Methods: Read More [+]
Objectives & Outcomes

Course Objectives: This course will provide students with knowledge of the physics of convective transport and an introduction to computational tools that can model convective processes in important applications such as electronics cooling, aerospace thermal management. The course also teaches students to construct computational models of natural and forced convection processes in boundary layers nears surfaces, in enclosures and in ducts or pipes that can be used to design heat exchangers and thermal management equipment for applications.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(g) an ability to communicate effectively
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Students will gain a knowledge of the mechanisms of convective heat and mass transfer for flow over surfaces and within ducts, and will develop the ability to construct computer programs that implement computation methods that predict the flow and temperature fields and heat transfer performance for convective flows of interest in engineering applications.

Rules & Requirements

Prerequisites: Undergraduate courses in engineering thermodynamics, fluid dynamics and heat transfer (MEC ENG 40, MEC ENG 106, and MEC ENG 109). Each student must have access to a PC, Macintosh or workstation machine with scientific programming capabilities for use in homework and projects

Credit Restrictions: Students should not receive credit for this course if they have taken ME 252 or ME 250B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Carey

Convective Transport and Computational Methods: Read Less [-]

MEC ENG 153 Applied Optics and Radiation 3 Units

Terms offered: Prior to 2007
Fundamentals of electromagnetic theory, principles of optics, waves, diffraction theory, interference, geometrical optics, scattering, theory of molecular spectra, optical and spectroscopic instrumentation. Lasers and laser materials processing, laser spectroscopy. Modern optics, plasmonics.
Applied Optics and Radiation: Read More [+]
Objectives & Outcomes

Course Objectives: The course will provide students with knowledge of the fundamental principles of optics to analyze optical phenomena and develop the background and skills to design optical instrumentation applied to engineering fields, including additive manufacturing, radiometry and spectroscopy.

Student Learning Outcomes: ABET Outcomes
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) an ability to identify, formulate, and solve engineering problems
(g) an ability to communicate effectively
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Students will gain knowledge of the EM theory, optical properties of materials, principles of spectroscopy for gases, liquids and solids, principles and applications of lasers and optical diagnostics. Students will develop the ability to design optical instrumentation systems in the context of key industrial applications, including additive manufacturing, materials processing, bio-optics, semiconductor industry applications, reacting systems, forensics.

Rules & Requirements

Prerequisites: Undergraduate courses in physics (e.g. 7A,B,C). Each student must have access to a PC, Macintosh or workstation machine with scientific programming capabilities for use in homework and projects

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Grigoropoulos

Applied Optics and Radiation: Read Less [-]

MEC ENG 154 Thermophysics for Applications 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
Development of classical thermodynamics from statistical treatment of microscale molecular behavior; Boltzmann distribution; partition functions; statistical-mechanical evaluation of thermodynamic properties; equilibrium; chemical equilibrium; phase transitions; molecular collisions; Maxwell-Boltzmann distribution; collision theory; elementary kinetic theory; molecular dynamics simulation of molecular collisions; kinetic Monte Carlo simulations of gas-phase and gas-surface reactions. Implications are explored for a variety of applications, which may include advanced combustion systems, renewable power systems, microscale transport in high heat flux electronics cooling, aerospace thermal management, and advanced materials processing.
Thermophysics for Applications: Read More [+]
Objectives & Outcomes

Course Objectives: To introduce students to the statistical foundation of thermodynamics and provide skills to perform advanced calculations for analysis of advanced energy conversion processes and devices.

Student Learning Outcomes: a knowledge of contemporary issues
an ability to apply knowledge of mathematics, science, and engineering
an ability to communicate effectively
an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
an ability to function on multi-disciplinary teams
an ability to identify, formulate, and solve engineering problems
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG 40

Credit Restrictions: Student will not receive credit for this course if they have taken ME 254.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Frenklach, Carey

Thermophysics for Applications: Read Less [-]

MEC ENG 160 Ocean Engineering Seminar 2 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
Lectures on new developments in ocean, offshore, and arctic engineering.
Ocean Engineering Seminar: Read More [+]
Objectives & Outcomes

Course Objectives: To provide exposure of the field of ocean engineering, arctic engineering and related subject areas to students with the intention to show the broad and interdisciplinary nature of this field, particularly recent or new developments.

Student Learning Outcomes: (f) an understanding of professional and ethical responsibility
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
Students will learn of new developments in ocean, offshore, and arctic engineering, connecting much of what is learned in other courses to practical applications and active research topics.

Rules & Requirements

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

Instructors: Makiharju, Alam

Ocean Engineering Seminar: Read Less [-]

MEC ENG 163 Engineering Aerodynamics 3 Units

Terms offered: Fall 2022, Fall 2021, Summer 2021 10 Week Session
Introduction to the lift, drag, and moment of two-dimensional airfoils, three-dimensional wings, and the complete airplane. Calculations of the performance and stability of airplanes in subsonic flight. The course run on two loosely aligned parallel tracks: a traditional sequence of lectures covering the basic topics in aerodynamics and a set of projects on vortex dynamics and aerodynamics that are loosely aligned with lectures. The distinguishing factor will be the extend of the projects assigned to the graduate level participants, which will be substantially more involved than those expected from the senior level participants.
Engineering Aerodynamics: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 40, MEC ENG 106

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Savas

Engineering Aerodynamics: Read Less [-]

MEC ENG 164 Marine Statics and Structures 3 Units

Terms offered: Fall 2012, Fall 2011, Fall 2009
Terminology and definition of hull forms, conditions of static equilibrium and stability of floating submerged bodies. Effects of damage on stability. Structural loads and response. Box girder theory. Isotropic and orthotropic plate bending and bucking.
Marine Statics and Structures: Read More [+]
Rules & Requirements

Prerequisites: Civil and Environmental Engineering 130 or 130N or consent of instructor

Credit Restrictions: Students will receive no credit for 164 after taking C164/Ocean Engineering C164; 2 units after taking 151.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Mansour

Formerly known as: C164

Marine Statics and Structures: Read Less [-]

MEC ENG 165 Ocean-Environment Mechanics 3 Units

Terms offered: Fall 2022, Spring 2020, Spring 2018
Ocean environment. Physical properties and characteristics of the oceans. Global conservation laws. Surface-waves generation. Gravity-wave mechanics, kinematics, and dynamics. Design consideration of ocean vehicles and systems. Model-testing techniques. Prediction of resistance and response in waves--physical modeling and computer models.
Ocean-Environment Mechanics: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 106 or CIV ENG 100

Credit Restrictions: Students will receive no credit for 165 after taking C165/Ocean Engineering C165.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Yeung

Formerly known as: C165

Ocean-Environment Mechanics: Read Less [-]

MEC ENG 167 Microscale Fluid Mechanics 3 Units

Terms offered: Spring 2018, Spring 2016, Spring 2015
Phenomena of physical, technological, and biological significance in flows of gases and liquids at the microscale. The course begins with familiar equations of Newtonian fluid mechanics, then proceeds to the study of essentially 1-D flows in confined geometries with the lubrication equations. Next is a study of the flow of thin films spreading under gravity or surface tension gradients. Lubrication theory of compressible gases leads to consideration of air bearings. Two- and 3-D flows are treated with Stokes' equations. Less familiar physical phenomena of significance and utility at the microscale are then considered: intermolecular forces in liquids, slip, diffusion and bubbles as active agents. A review of relevant aspects of electricity and magnetism precedes a study of electrowetting and electrokinetically driven liquid flows.
Microscale Fluid Mechanics: Read More [+]
Rules & Requirements

Prerequisites: 40, 106, 109, (106 and 109 may be taken concurrently) Physics 7B or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Morris, Szeri

Microscale Fluid Mechanics: Read Less [-]

MEC ENG 168 Mechanics of Offshore Systems 3 Units

Terms offered: Fall 2022, Fall 2020, Spring 2019
This course covers major aspects of offshore engineering including ocean environment, loads on offshore structures, cables and mooring, underwater acoustics and arctic operations.
Mechanics of Offshore Systems: Read More [+]
Objectives & Outcomes

Course Objectives: To provide a basic to intermediate level of treatment of engineering systems that operate in coastal, offshore, and arctic environment. Students will acquire an understanding of the unique and essential character of the marine fields and the analysis tools to handle the engineering aspects of them.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30 and MEC ENG 106; MEC ENG 165 is recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Alam

Mechanics of Offshore Systems: Read Less [-]

MEC ENG 170 Engineering Mechanics III 3 Units

Terms offered: Fall 2022, Spring 2020, Spring 2019
This course builds upon material learned in 104, examining the dynamics of particles and rigid bodies moving in three dimensions. Topics include non-fixed axis rotations of rigid bodies, Euler angles and parameters, kinematics of rigid bodies, and the Newton-Euler equations of motion for rigid bodies. The course material will be illustrated with real-world examples such as gyroscopes, spinning tops, vehicles, and satellites. Applications of the material range from vehicle navigation to celestial mechanics, numerical simulations, and animations.
Engineering Mechanics III: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 104 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: O'Reilly, Casey

Engineering Mechanics III: Read Less [-]

MEC ENG 172 Wildland Fires: Science and Applications 3 Units

Terms offered: Spring 2022
This course presents an introduction to the global problem of wildland fires with an overview of the social, political and environmental issues posed as well as detailed coverage of the science, technology and applications used to predict, prevent and suppress wildland fires. Some specific topics covered will include fire spread theory, risk mapping, research instrumentation, suppression, ignition sources, relevant codes and standards, remote sensing, smoke management, and extreme fire behavior. Engineering analyses in many of these areas, as well as specific coverage of fire protection design in the Wildland-Urban Interface (WUI) will also be covered.
Wildland Fires: Science and Applications: Read More [+]
Objectives & Outcomes

Course Objectives: The course objectives are to provide students with the knowledge necessary to work within the highly interdisciplinary field of wildland fire, including a broad understanding of the social, ecological, and economic factors influencing wildland fire, a firm understanding of the underlying mechanisms affecting wildland fire processes, and an ability to apply the tools necessary to predict the spread rate and intensity of wildland fires and assess protection of WUI communities.

Student Learning Outcomes: (a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG 109 or equivalent course in heat transfer (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Michael Gollner

Wildland Fires: Science and Applications: Read Less [-]

MEC ENG 173 Fundamentals of Acoustics 3 Units

Terms offered: Spring 2017, Spring 2013, Spring 2011
Plane and spherical sound waves. Sound intensity. Propagation in tubes and horns. Resonators. Standing waves. Radiation from oscillating surface. Reciprocity. Reverberation and diffusion. Electro-acoustic loud speaker and microphone problems. Environmental and architectural acoustics. Noise measurement and control. Effects on man.
Fundamentals of Acoustics: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Johnson

Fundamentals of Acoustics: Read Less [-]

MEC ENG 174 Nonlinear and Random Vibrations 3 Units

Terms offered: Spring 2021
Oscillations in nonlinear systems having one or two degrees of freedom. Graphical, iteration, perturbation, and asymptotic methods. Self-excited oscillations and limit cycles. Random variables and random processes. Analysis of linear and nonlinear, discrete and continuous, mechanical systems under stationary and non-stationary excitations.
Nonlinear and Random Vibrations: Read More [+]
Objectives & Outcomes

Course Objectives: To give a compact, consistent, and reasonably connected account of the theory of nonlinear vibrations and uncertainty analysis. Applications will be mentioned whenever feasible. A secondary purpose is to survey some topics of contemporary research.

Student Learning Outcomes: Acquired necessary knowledge and scientific maturity to apply methods of nonlinear and uncertainty analysis in engineering design and optimization.

An ability to apply knowledge of mathematics, science, and engineering. An ability to identify, formulate, and solve engineering problems. The broad education necessary to understand the impact of engineering solutions in a global and societal context. A knowledge of contemporary issues. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
This course provides valuable training in the modeling and analysis of mechanical engineering systems using nonlinear and uncertainty analysis. It also serves to reinforce and emphasize the connection between fundamental engineering science and practical problem solving.

Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Ma

Nonlinear and Random Vibrations: Read Less [-]

MEC ENG 175 Intermediate Dynamics 3 Units

Terms offered: Spring 2022, Fall 2021, Fall 2020
This course introduces and investigates Lagrange's equations of motion for particles and rigid bodies. The subject matter is particularly relevant to applications comprised of interconnected and constrained discrete mechanical components. The material is illustrated with numerous examples. These range from one-dimensional motion of a single particle to three-dimensional motions of rigid bodies and systems of rigid bodies.
Intermediate Dynamics: Read More [+]
Objectives & Outcomes

Course Objectives: Introduce students to the notion of exploiting differential geometry to gain insight into the dynamics of a mechanical system. Familiarize the student with classifications and applications of generalized forces and kinematical constraints. Enable the student to establish Lagrange's equations of motion for a single particle, a system of particles and a single rigid body. Establish equivalence of equations of motion using the Lagrange and Newton-Euler approaches. Discuss the developments of analytical mechanics drawing from applications in navigation, vehicle dynamics, toys, gyroscopes, celestial mechanics, satellite dynamics and computer animation.

Student Learning Outcomes: This course provides valuable training in the modeling and analysis of mechanical engineering systems using systems of particles and/or rigid bodies. It also serves to reinforce and emphasize the connection between fundamental engineering science and practical problem-solving.
a) An ability to apply knowledge of mathematics, science, and engineering.
e) An ability to identify, formulate, and solve engineering problems.
h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
j) A knowledge of contemporary issues.
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: MEC ENG 104

Credit Restrictions: Students will receive no credit for MEC ENG 175 after completing MEC ENG 271.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: O'Reilly, Casey

Intermediate Dynamics: Read Less [-]

MEC ENG C176 Orthopedic Biomechanics 4 Units

Terms offered: Fall 2022, Fall 2020, Fall 2019
Statics, dynamics, optimization theory, composite beam theory, beam-on-elastic foundation theory, Hertz contact theory, and materials behavior. Forces and moments acting on human joints; composition and mechanical behavior of orthopedic biomaterials; design/analysis of artificial joint, spine, and fracture fixation prostheses; musculoskeletal tissues including bone, cartilage, tendon, ligament, and muscle; osteoporosis and fracture-risk predication of bones; and bone adaptation. MATLAB-based project to integrate the course material.
Orthopedic Biomechanics: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30 or BIO ENG 102 (concurrent enrollment OK). Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Keaveny

Also listed as: BIO ENG C119

Orthopedic Biomechanics: Read Less [-]

MEC ENG C178 Designing for the Human Body 4 Units

Terms offered: Fall 2019, Fall 2018, Fall 2017
The course provides project-based learning experience in understanding product design, with a focus on the human body as a mechanical machine. Students will learn the design of external devices used to aid or protect the body. Topics will include forces acting on internal materials (e.g., muscles and total replacement devices), forces acting on external materials (e.g., prothetics and crash pads), design/analysis of devices aimed to improve or fix the human body, muscle adaptation, and soft tissue injury. Weekly laboratory projects will incorporate EMG sensing, force plate analysis, and interpretation of data collection (e.g., MATLAB analysis) to integrate course material to better understand contemporary design/analysis/problems.
Designing for the Human Body: Read More [+]
Objectives & Outcomes

Course Objectives: The purpose of this course is twofold:
•
to learn the fundamental concepts of designing devices to interact with the human body;
•
to enhance skills in mechanical engineering and bioengineering by analyzing the behavior of various complex biomedical problems;
•
To explore the transition of a device or discovery as it goes from “benchtop to bedside”.

Student Learning Outcomes: RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Working knowledge of design considerations for creating a device to protect or aid the human body, force transfer and distribution, data analysis, and FDA approval process for new devices. Understanding of basic concepts in orthopaedic biomechanics and the ability to apply the appropriate engineering concepts to solve realistic biomechanical problems, knowing clearly the assumptions involved. Critical analysis of current literature and technology.

Rules & Requirements

Prerequisites: PHYSICS 7A, MATH 1A, and MATH 1B. Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed

Credit Restrictions: There will be no credit given for MEC ENG C178 / BIO ENG C137 after taking MEC ENG 178.

Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of lecture per week

MEC ENG 179 Augmenting Human Dexterity 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
This course provides hands-on experience in designing prostheses and assistive technologies using user-centered design. Students will develop a fundamental understanding of the state-of-the-art, design processes and product realization. Teams will prototype a novel solution to a disabilities-related challenge, focusing on upper-limb mobility or dexterity. Lessons will cover biomechanics of human manipulation, tactile sensing and haptics, actuation and mechanism robustness, and control interfaces. Readings will be selected from texts and academic journals available through the UCB online library system and course notes. Guest speakers will be invited to address cutting edge breakthroughs relevant to assistive technology and design.
Augmenting Human Dexterity: Read More [+]
Objectives & Outcomes

Course Objectives: The course objectives are to:
- Learn the fundamental principles of biomechanics, dexterous manipulation, and electromechanical systems relevant for non-invasive, cutting-edge assistive device and prosthesis design.
- Enhance skill in the areas of human-centered design, teamwork and communication through the practice of conducting labs and a project throughout the semester.

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(j) a knowledge of contemporary issues

Rules & Requirements

Prerequisites: MEC ENG 132 or equivalent. Proficiency with Matlab or equivalent programming language

Credit Restrictions: Students will receive no credit for MEC ENG 179 after completing MEC ENG 270.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Stuart

Augmenting Human Dexterity: Read Less [-]

MEC ENG C180 Engineering Analysis Using the Finite Element Method 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
This is an introductory course on the finite element method and is intended for seniors in engineering and applied science disciplines. The course covers the basic topics of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems. Finite element formulations for several important field equations are introduced using both direct and integral approaches. Particular emphasis is placed on computer simulation and analysis of realistic engineering problems from solid and fluid mechanics, heat transfer, and electromagnetism. The course uses FEMLAB, a multiphysics MATLAB-based finite element program that possesses a wide array of modeling capabilities and is ideally suited for instruction. Assignments will involve both paper- and computer-based exercises. Computer-based assignments will emphasize the practical aspects of finite element model construction and analysis.
Engineering Analysis Using the Finite Element Method: Read More [+]
Rules & Requirements

Prerequisites: Engineering 7 or 77 or Computer Science 61A; Mathematics 53 and 54; senior status in engineering or applied science

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Also listed as: CIV ENG C133

Engineering Analysis Using the Finite Element Method: Read Less [-]

MEC ENG C184 Flight Vehicle Structures and Aeroelasticity 3 Units

Terms offered: Not yet offered
This course introduces engineering students to the analysis and design of load-bearing components of flight structures, ranging from subsonic aircraft to rockets. Emphasis is placed on the quasi-static and dynamic analysis of structural components which are prevalent in aerospace engineering. Attention is also devoted to a comprehensive design roadmap of flight vehicle structures from the full system- to the individual component-level
Flight Vehicle Structures and Aeroelasticity: Read More [+]
Objectives & Outcomes

Course Objectives: 1. Familiarize students with the different load-bearing components and loads encountered in flight vehicles.

2. Sharpen the students’ skills in the statics and dynamics of thin-walled structures.

3. Enhance the students’ aerospace engineering design skills by leveraging the use of the finite element method as a tool for both global and local analysis.

Student Learning Outcomes: Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

(g) A knowledge of contemporary issues.

Ability to apply knowledge of mathematics, science, and engineering.

Ability to design and conduct experiments, as well as to analyze and interpret data
Ability to identify, formulate, and solve engineering problems.

Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Understanding of professional and ethical responsibility.

Rules & Requirements

Prerequisites: CIV ENG C30 / MEC ENG C85, and MEC ENG 104 or CIV ENG 126

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Papadopoulos

Formerly known as: Mechanical Engineering 184

Also listed as: AERO ENG C184/CIV ENG C138

Flight Vehicle Structures and Aeroelasticity: Read Less [-]

MEC ENG 185 Introduction to Continuum Mechanics 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020
This course is a general introduction to the fundamental concepts of the mechanics of continuous media. Topics covered include the kinematics of deformation, the concept of stress, and the conservation laws for mass, momentum and energy. This is followed by an introduction to constitutive theory with applications to well-established models for viscous fluids and elastic solids. The concepts are illustrated through the solution of tractable initial-boundary-value problems. This course presents foundation-level coverage of theory underlying a number of sub-fields, including Fluid Mechanics, Solid Mechanics and Heat Transfer.
Introduction to Continuum Mechanics: Read More [+]
Objectives & Outcomes

Course Objectives: Students will gain a deep understanding of the concepts and methods underlying modern continuum mechanics. The course is designed to equip students with the background needed to pursue advanced work in allied fields.

Student Learning Outcomes: ABET Outcomes:
(a) an ability to apply knowledge of mathematics, science, and engineering,
(e) an ability to identify, formulate, and solve engineering problems,
(g) an ability to communicate effectively,
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
(i) a recognition of the need for, and an ability to engage in life-long learning,
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Prerequisites: PHYSICS 7A, MATH 53, and MATH 54; some prior exposure to the elementary mechanics of solids and fluids

Credit Restrictions: Students will not receive credit if they have taken ME 287.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Casey, Johnson, Papadopoulos, Steigmann

Introduction to Continuum Mechanics: Read Less [-]

MEC ENG 190L Practical Control System Design: A Systematic Loopshaping Approach 1 Unit

Terms offered: Spring 2018, Fall 2015, Spring 2014
After a review of basic loopshaping, we introduce the loopshaping design methodology of McFarlane and Glover, and learn how to use it effectively. The remainder of the course studies the mathematics underlying the new method (one of the most prevalent advanced techniques used in industry) justifying its validity.
Practical Control System Design: A Systematic Loopshaping Approach: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 132, MEC ENG C134/EL ENG C128, or similar introductory experience regarding feedback control systems

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Packard

Practical Control System Design: A Systematic Loopshaping Approach: Read Less [-]

MEC ENG 190M Model Predictive Control 1 Unit

Terms offered: Spring 2015, Fall 2009
Basics on optimization and polyhedra manipulation. Analysis and design of constrained predictive controllers for linear and nonlinear systems.
Model Predictive Control: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 132

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Borrelli

Model Predictive Control: Read Less [-]

MEC ENG 190Y Practical Control System Design: A Systematic Optimization Approach 1 Unit

Terms offered: Spring 2013, Spring 2010, Spring 2009
The Youla-parametrization of all stabilizing controllers allows certain time-domain and frequency-domain closed-loop design objectives to be cast as convex optimizations, and solved reliably using off-the-shelf numerical optimization codes. This course covers the Youla parametrization, basic elements of convex optimization, and finally control design using these techniques.
Practical Control System Design: A Systematic Optimization Approach: Read More [+]
Rules & Requirements

Prerequisites: MEC ENG 132, MEC ENG C134/EL ENG C128, or similar introductory experience regarding feedback control systems

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Packard

Practical Control System Design: A Systematic Optimization Approach: Read Less [-]

MEC ENG 191K Professional Communication 3 Units

Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
This course is designed to enhance students' written and oral communication skills. Written work consists of informal documents--correspondence, internal reports, and reviews--and formal work--proposals, conference papers, journal articles, and websites. Presentations consist of informal and formal reports, including job and media interviews, phone interviews, conference calls, video conferences, progress reports, sales pitches, and feasibility studies.
Professional Communication: Read More [+]
Rules & Requirements

Prerequisites: Reading and Composition parts A and B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer:
6 weeks - 8 hours of lecture per week
8 weeks - 5.5 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Professional Communication: Read Less [-]

MEC ENG 193A Special Topics in Biomechanical Engineering 1 - 4 Units

Terms offered: Spring 2022, Spring 2017
This 193 series covers current topics of research interest in biomechanical engineering. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Biomechanical Engineering: Read More [+]
Objectives & Outcomes

Course Objectives: Course objectives will vary.

Student Learning Outcomes: Student outcomes will vary.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Biomechanical Engineering: Read Less [-]

MEC ENG 193B Special Topics in Controls 1 - 4 Units

Terms offered: Fall 2020, Fall 2019, Fall 2018
This 193 series covers current topics of research interest in controls. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Controls: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Special Topics in Controls: Read Less [-]

MEC ENG 193C Special Topics in Design 1 - 4 Units

Terms offered: Fall 2018, Fall 2016
This 193 series covers current topics of research interest in design. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Design: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Design: Read Less [-]

MEC ENG 193D Special Topics in Dynamics 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in dynamics. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Dynamics: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Dynamics: Read Less [-]

MEC ENG 193E Special Topics in Energy Science and Technology 1 - 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020
This 193 series covers current topics of research interest in energy science and technology. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Energy Science and Technology: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Energy Science and Technology: Read Less [-]

MEC ENG 193F Special Topics in Fluids 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in fluids. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Fluids: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Fluids: Read Less [-]

MEC ENG 193G Special Topics in Manufacturing 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in manufacturing. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Manufacturing: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary by course.

Student Learning Outcomes: Will vary by course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Manufacturing: Read Less [-]

MEC ENG 193H Special Topics in Materials 1 - 4 Units

Terms offered: Spring 2020
This 193 series covers current topics of research interest in materials. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Materials: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Materials: Read Less [-]

MEC ENG 193I Special Topics in Mechanics 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in mechanics. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Mechanics: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Mechanics: Read Less [-]

MEC ENG 193J Special Topics in MEMS/Nano 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in MEMS/nano. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in MEMS/Nano: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in MEMS/Nano: Read Less [-]

MEC ENG 193K Special Topics in Ocean Engineering 1 - 4 Units

Terms offered: Prior to 2007
This 193 series covers current topics of research interest in ocean engineering. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Ocean Engineering: Read More [+]
Objectives & Outcomes

Course Objectives: Will vary by course.

Student Learning Outcomes: Will vary by course.

Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Faculty

Special Topics in Ocean Engineering: Read Less [-]

MEC ENG H194 Honors Undergraduate Research 2 - 4 Units

Terms offered: Fall 2022, Summer 2022 8 Week Session, Summer 2022 Second 6 Week Session
Final report required. Students who have completed a satisfactory number of advanced courses may pursue original research under the direction of one of the members of the faculty. A maximum of three units of H194 may be used to fulfill technical elective requirements in the Mechanical Engineering program (unlike 198 or 199, which do not satisfy technical elective requirements). Students can use a maximum of three units of graded research units (H194 or 196) towards their technical elective requirement.
Honors Undergraduate Research: Read More [+]
Rules & Requirements

Prerequisites: 3.3 cumulative GPA or higher, consent of instructor and adviser, and senior standing

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 4-8 hours of independent study per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Honors Undergraduate Research: Read Less [-]

MEC ENG 196 Undergraduate Research 2 - 4 Units

Terms offered: Summer 2022 Second 6 Week Session, Spring 2022, Fall 2021
Students who have completed a satisfactory number of advanced courses may pursue original research under the direction of one of the members of the staff. A maximum of three units of 196 may be used to fulfill technical elective requirements in the Mechanical Engineering program (unlike 198 or 199, which do not satisfy technical elective requirements). Students can use a maximum of three units of graded research units (H194 or 196) towards their technical elective requirement. Final report required.
Undergraduate Research: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor and adviser; junior or senior standing

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of independent study per week

Summer:
6 weeks - 5-10 hours of independent study per week
8 weeks - 4-8 hours of independent study per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Undergraduate Research: Read Less [-]

MEC ENG 197 Undergraduate Engineering Field Studies 1 - 4 Units

Terms offered: Fall 2015, Summer 2015 10 Week Session
Supervised experience relative to specific aspects of practice in engineering. Under guidance of a faculty member, the student will work in industry, primarily in an internship setting or another type of short-time status. Emphasis is to attain practical experience in the field.
Undergraduate Engineering Field Studies: Read More [+]
Objectives & Outcomes

Student Learning Outcomes: (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 3-12 hours of internship per week

Summer:
6 weeks - 8-30 hours of internship per week
10 weeks - 5-18 hours of internship per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Undergraduate Engineering Field Studies: Read Less [-]

MEC ENG 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Spring 2022, Fall 2021, Spring 2021
Group study of a selected topic or topics in Mechanical Engineering. Credit for 198 or 199 courses combined may not exceed 4 units in any single term. See College for other restrictions.
Directed Group Studies for Advanced Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Upper division standing and good academic standing

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Summer: 10 weeks - 1.5-6 hours of directed group study per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Directed Group Studies for Advanced Undergraduates: Read Less [-]

MEC ENG 199 Supervised Independent Study 1 - 4 Units

Terms offered: Spring 2022, Fall 2021, Spring 2021
Supervised independent study. Enrollment restrictions apply; see the introduction to Courses and Curricula section of this catalog.
Supervised Independent Study: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Supervised Independent Study: Read Less [-]