Mechanical Engineering and Business Administration

M.E.T. at a Glance: One program, Two Bachelor of Science (BS) degrees

The Mechanical Engineering and Business Administration simultaneous degree is part of the Management, Entrepreneurship, & Technology Program. The M.E.T. Program aims to educate leaders with a seamless understanding of technology innovation, from idea to real-world impact.

M.E.T. students earn two Bachelor of Science degrees in one program that combines the best of the top-ranked College of Engineering and Haas School of Business. The integrated curriculum is completed in four years. Internships, career coaching, and other enrichment activities provide ample opportunity for hands-on experience with innovation and entrepreneurship. Each M.E.T. cohort is small, allowing for close mentoring and a tight-knit community.

Admission to the M.E.T. Program

The M.E.T. Program seeks inquisitive, self-motivated students with a passion for finding and solving big problems. It is highly competitive and is only open to freshmen during the UC application period. Freshman admission is limited to a maximum of 50 students.

For further information, please see the M.E.T. website (http://met.berkeley.edu).

Accreditation

The ME undergraduate degree program in the College of Engineering is accredited by ABET. The Undergraduate Business Degree Program is accredited by The Association to Advance Collegiate Schools of Business (AACSB).

In addition to the University, campus, and M.E.T. Program requirements, listed on the College Requirements tab, students must fulfill the below requirements.

General Guidelines

1. A minimum of 38 upper division business units are required.
2. Students must complete the College Requirements and the Major Requirements.
3. Students must complete the degree program in eight semesters. (Summer Session is not required for degree completion in eight semesters.)
4. All Haas business courses must be taken for a letter grade, including core substitutions, with the exception of UGBA 194 (http://guide.berkeley.edu/undergraduate/colleges-schools/haas-business/#collegerequirements) or UGBA 198 (http://guide.berkeley.edu/undergraduate/colleges-schools/haas-business/#collegerequirements) (only offered Pass/No Pass).
5. All technical courses that can be used to fulfill a requirement must be taken for a letter grade.
6. Students who receive a grade of D+ or lower in a core UGBA course must repeat the course until they achieve a grade of C- or better.
7. Students in this program must adhere to all policies and procedures of the College of Engineering and the Haas School of Business.

For information regarding University and campus requirements, Reading and Composition, breadth, class schedule, minimum academic progress, and unit requirements, please see the College Requirements (http://guide.berkeley.edu/undergraduate/colleges-schools/haas-business/#collegerequirements).

Lower Division Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>UGBA 10</td>
<td>Principles of Business</td>
<td>3</td>
</tr>
<tr>
<td>ECON 1</td>
<td>Introduction to Economics</td>
<td>4</td>
</tr>
<tr>
<td>STAT 20</td>
<td>Introduction to Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>or STAT 21</td>
<td>Introductory Probability and Statistics for Business</td>
<td></td>
</tr>
<tr>
<td>or STAT 131A</td>
<td>Introduction to Probability and Statistics for Life Scientists</td>
<td></td>
</tr>
<tr>
<td>or STAT 134</td>
<td>Concepts of Probability</td>
<td></td>
</tr>
<tr>
<td>or COMPSCI C8 &amp; STAT 88</td>
<td>Foundations of Data Science and Probability and Mathematical Statistics in Data Science</td>
<td></td>
</tr>
<tr>
<td>MATH 1A</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1B</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 53</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 54</td>
<td>Linear Algebra and Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 1AL</td>
<td>General Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 4A</td>
<td>General Chemistry and Quantitative Analysis</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 7A</td>
<td>Physics for Scientists and Engineers</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 7B</td>
<td>Physics for Scientists and Engineers</td>
<td>4</td>
</tr>
<tr>
<td>ENGIN 7</td>
<td>Introduction to Computer Programming for Scientists and Engineers</td>
<td>4</td>
</tr>
<tr>
<td>ENGIN 25</td>
<td>Visualization for Design</td>
<td>2</td>
</tr>
<tr>
<td>ENGIN 26</td>
<td>Three-Dimensional Modeling for Design</td>
<td>2</td>
</tr>
<tr>
<td>ENGIN 27</td>
<td>Introduction to Manufacturing and Tolerancing</td>
<td>2</td>
</tr>
<tr>
<td>MEC ENG 40</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>MEC ENG C85</td>
<td>Introduction to Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EL ENG 49</td>
<td>Electronics for the Internet of Things</td>
<td>4</td>
</tr>
</tbody>
</table>

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

Upper Division Requirements

ME Upper Division

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC ENG 102B</td>
<td>Mechatronics Design</td>
<td>4</td>
</tr>
<tr>
<td>MEC ENG 103</td>
<td>Experimentation and Measurements</td>
<td>4</td>
</tr>
<tr>
<td>MEC ENG 104</td>
<td>Engineering Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>MEC ENG 106</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MEC ENG 108</td>
<td>Mechanical Behavior of Engineering Materials</td>
<td></td>
</tr>
<tr>
<td>MEC ENG 109</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>MEC ENG 132</td>
<td>Dynamic Systems and Feedback</td>
<td>3</td>
</tr>
</tbody>
</table>

Technical electives, minimum 15 units 1,2,3

Select at least one course from the design elective list:
Select at least one course from quantitative science elective list:

- ENGIN 117 Methods of Engineering Analysis [3]
- ENGIN 177 Advanced Programming with MATLAB [3]
- MEC ENG 120 Computational Biomechanics Across Multiple Scales [3]
- MEC ENG 187 Engineering Analysis Using the Finite Element Method [3]

Technical electives: 15 units of technical electives (http://www.me.berkeley.edu/undergraduate/course-information/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, and ENGIN 177 can count toward the 9 unit upper division ME course requirement. 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.

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, COMPSCI 61A, COMPSCI 61B, COMPSCI 61C, COMPSCI 70, DES INV 15, DES INV 90E, EPS 50, EL ENG 16B, MATH 55, MAT SCI 45, MCELLB 32, PHYSICS 7C, STAT 20, STAT 21.

Technical electives cannot include:
- Any course taken on a Pass/No Pass basis
- Courses numbered 24, 39, 84, or 88
- Any of the following courses: BIO ENG 100, COMPSCI C79, COMPSCI 195, COMPSCI H195, DES INV courses (except DES INV 15, DES INV 90E, DES INV 90E), ENGIN 125, ENGIN 157AC, ENGIN 180, 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, and MEC ENG 191K.

UGBA Upper Division

- UGBA 100 Business Communication [2]
- UGBA 101A Microeconomic Analysis for Business Decisions [3]
- UGBA 101B Macroeconomic Analysis for Business Decisions [3]
- UGBA 102A Introduction to Financial Accounting [3]
- UGBA 102B Managerial Accounting [3]
- UGBA 103 Introduction to Finance [4]
- UGBA 104 Introduction to Business Analytics [3]
- UGBA 105 Leading People [3]
- UGBA 106 Marketing [3]
- UGBA 107 The Social, Political, and Ethical Environment of Business [3]

M.E.T. Special Topics

Two courses are required. M.E.T. Special Topics courses will count as upper division business units.

Upper Division Business Administration Elective Courses

Select a minimum of 4-6 units of upper division UGBA elective courses in order to complete a minimum of 38 units of upper division Business Administration courses.

- UGBA 113 Managerial Economics [3]
- UGBA 115 Competitive Strategy [3]
- UGBA 117 Special Topics in Econometric Analysis and Policy [1-4]
- UGBA 118 International Trade [3]
- UGBA 119 Leading Strategy Implementation [3]
- UGBA 120B Advanced Financial Accounting [4]
- UGBA 122 Financial Information Analysis [4]
- UGBA W125 Professional Judgment in Accounting [3]
- UGBA 126 Auditing [4]
- UGBA 127 Special Topics in Accounting [1-4]
- UGBA 128 Strategic Cost Management [3]
- UGBA 131 Corporate Finance and Financial Statement Analysis [3]
- UGBA 132 Financial Institutions and Markets [3]
- UGBA 133 Investments [3]
- UGBA 136F Behavioral Finance [3]
- UGBA 137 Special Topics in Finance [1-4]
- UGBA 141 Production and Operations Management [3]
- UGBA 143 Game Theory and Business Decisions [3]
- UGBA 147 Special Topics in Operations and Information Technology Management [1-4]
- UGBA 151 Management of Human Resources [3]
- UGBA 152 Negotiation and Conflict Resolution [3]
- UGBA 154 Power and Politics in Organizations [2,3]
- UGBA 155 Leadership [3]
- UGBA 156AC Diversity in the Workplace [3]
- UGBA 157 Special Topics in the Management of Organizations [1-4]
- UGBA 160 Consumer Behavior [3]
- UGBA 161 Market Research: Tools and Techniques for Data Collection and Analysis [3]
- UGBA 162 Brand Management and Strategy [3]
- UGBA 162A Product Branding and Branded Entertainment [2]
- UGBA 165 Advertising Strategy [3]
Entry Level Writing (http://guide.berkeley.edu/undergraduate/colleges-schools/haas-business/entry-level-writing-requirement)

All students who enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing Requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions (http://guide.berkeley.edu/undergraduate/colleges-schools/haas-business/american-history-institutions-requirement)

The American History and Institutions requirements are based on the principle that a U.S. resident who graduates 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/colleges-schools/haas-business/american-cultures-requirement)

American Cultures (AC) is the one requirement that all undergraduate students at UC Berkeley need to take and pass in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity, and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American culture.

M.E.T. Program Requirements

Reading and Composition

Two Reading and Composition (R&C) courses must be taken for a letter grade (C- or better required), and must be completed by no later than the end of the sophomore year (4th semester of enrollment). The first half of R&C, the "A" course, must be completed by the end of the freshman year; the second half of R&C, the "B" course, by no later than the end of the sophomore year or a student's registration will be blocked. View a detailed list of courses (http://guide.berkeley.edu/undergraduate/colleges-schools/engineering/reading-composition-requirement) that fulfill Reading and Composition requirements.

Breadth Requirement

The undergraduate breadth requirement provides Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepare Berkeley graduates to understand and solve the complex issues of their day.

Students in the M.E.T. Program must successfully complete six breadth courses, one in each of the following categories:

- Arts and Literature
- Historical Studies
- International Studies
- Philosophy and Values (will be satisfied with UGBA 107)
- Physical Science (will be satisfied with Physics 7B)
- Social and Behavioral Sciences (will be satisfied with Econ 1)

• With the exception of UGBA 107, UGBA courses cannot be used to fulfill breadth requirements.
With the exception of Econ 1, microeconomics and macroeconomics at any level (Econ 2, Econ 3, Econ 100A/B, Econ 101A/B, IAS 106/107) cannot be used to fulfill breadth requirements.

Courses offered by any Engineering department, with the exception of BIO ENG 100, COMPSCI C79, ENGIN 125, 157AC, MEC ENG 191K and 191AC, cannot be used to fulfill breadth requirements.

No more than two courses from any one department may be used to satisfy the breadth requirement (L&S Discovery courses (http://lsdiscovery.berkeley.edu) are exempt).

Advanced Placement or International Baccalaureate exams cannot be used to fulfill the breadth requirement. Some A-Level exams are accepted, but a maximum of two A-Level exams may be used to fulfill breadth requirements.

Two of the breadth courses must be upper-division (courses numbered 100-196).

Courses numbered 97, 98, 99, or above 196 may not be used to complete any breadth requirement.

Breadth courses must be a minimum of 3 semester units.

Reading & Composition courses cannot be used to fulfill breadth requirements.

Class Schedule Requirements

- Minimum units per semester: 13
- Maximum units per semester: 20.5
- Students in the M.E.T. Program must enroll each semester in no fewer than two technical courses (of a minimum of 3 units each) required of the engineering major program of study in which the student is officially declared.

Minimum Academic (Grade) Requirements

- A minimum overall and semester grade point average of 2.000 (C average) is required. Students will be subject to dismissal from the University if during any fall or spring semester their overall U.C. GPA falls below 2.000, or their semester GPA is less than 2.000.
- Students must achieve a minimum GPA of 2.000 (C average) in upper division technical courses each semester. Students will be subject to dismissal from the University if their upper division technical GPA falls below 2.000.
- A minimum overall GPA of 2.000, and a minimum 2.000 GPA in upper division technical course work required of the major are required to graduate.

Unit Requirements

- A minimum of 120 units are required to graduate.
- A maximum of 16 units of Special Studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) will count towards the 120 units; a maximum of four are allowed in a given semester.
- A maximum of four units of Physical Education from any school attended will count towards the 120 units.
- No more than 1/3 of a student’s total UC Berkeley units may be taken Pass/No Pass, including physical education courses, Education Abroad Program, or courses taken on another UC campus.

University of California Requirements

Entry Level Writing (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/entry-level-writing-requirement)

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing Requirement. Satisfaction of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/american-history-institutions-requirement)

The American History and Institutions requirements are based on the principle that a U.S. 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/colleges-schools/natural-resources/american-cultures-requirement)

American Cultures (AC) is the one requirement that all undergraduate students at UC Berkeley need to take and pass in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity, and culture in the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.
### Total Units: 150

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Units</th>
<th>Spring Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC ENG 103</td>
<td>4 MEC ENG 102B</td>
<td>4</td>
</tr>
<tr>
<td>Tech Elective (Design Requirement)</td>
<td>3 UGBA 102B</td>
<td>3</td>
</tr>
<tr>
<td>UGBA 102A</td>
<td>3 UGBA 105</td>
<td>3</td>
</tr>
<tr>
<td>UGBA 103</td>
<td>4 UGBA 107</td>
<td>3</td>
</tr>
<tr>
<td>UGBA 104</td>
<td>3 Tech Elective</td>
<td>3</td>
</tr>
<tr>
<td>M.E.T. Special Topics (UGBA 196)</td>
<td>2 UGBA Elective</td>
<td>2</td>
</tr>
</tbody>
</table>

**Fall** Units: 17  **Spring** Units: 16

1. MATH 1A may be fulfilled with a score of 3, 4 or 5 on the AP Calculus AB or BC exam, a score of 5, 6 or 7 on the IB Higher Level Math exam, or a grade of A, B or C on the A-Level Math H1, H2, H3, Pure Math or Further Math exam.
2. CHEM 1A/CHEM 1AL may be fulfilled with a score of 3, 4 or 5 on the AP Chemistry exam, a score of 5, 6 or 7 on the IB Higher Level Chemistry exam, or a grade of A, B or C on the A-Level Chemistry exam. CHEM 4A is intended for students majoring in chemistry or a closely-related field.
3. ECON 1 and UGBA 107 will be accepted for the Social and Behavioral Sciences and Philosophy and Values breadth requirements, respectively, as exceptions for students in the M.E.T. Program. The Biological Science breadth requirement is waived for students in the M.E.T. Program. In order to satisfy the College of Engineering Humanities and Social Sciences requirement, two of the breadth courses must be upper division. Some American Cultures courses will also fulfill the Arts & Literature or Historical Studies breadth requirement; use Requirements filters to search the Class Schedule (http://classes.berkeley.edu/) for courses that apply. See "College Requirements (p. 3)" tab for further restrictions on breadth courses.
4. ECON 1 may be fulfilled with scores of 4 or 5 on both the AP Microeconomics exam and AP Macroeconomics exam. However, the Social and Behavioral Sciences Breadth requirement cannot be fulfilled with AP exam scores.
5. Reading & Composition part A may be fulfilled with a score of 4 or 5 on the AP English Language and Composition exam or the AP English Literature and Composition exam, or a score of 5, 6 or 7 on the IB Higher Level English Literature exam or the IB Higher Level English Language and Literature exam.
6. MATH 1B may be fulfilled with a score of 4 or 5 on the AP Calculus BC exam, a score of 5, 6 or 7 on the IB Higher Level Math exam, or a grade of A, B or C on the A-Level Math H2, H3, Pure Math or Further Math exam.
7. PHYSICS 7A may be fulfilled with a score of 5 on the AP Physics C Mechanics exam.
8. Technical electives: 15 units of technical electives (http://www.me.berkeley.edu/undergraduate/course-information/undergraduate-technical-electives) are required, of which at least 9 units must be upper division mechanical engineering courses. Of these 9 units, 3 units must be a design course selected from the following: ENGIN 128, MEC ENG 101, MEC ENG 110, MEC ENG C117, MEC ENG 119, MEC ENG 130, MEC ENG 135, MEC ENG 146, MEC ENG 165, MEC ENG C176, MEC ENG C178. Also, one of the technical elective courses must be selected from the quantitative science list: ENGIN 117, ENGIN 177, MEC ENG 120, MEC ENG C180. 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, and ENGIN 177 can count toward the 9 unit upper division ME course requirement. 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.
9. Up to three units of lower division coursework can count toward the technical elective requirement. Approved lower division courses include: 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, COMPSCI 61A, COMPSCI 61B, COMPSCI 61C, COMPSCI 70, DES INV 15, DES INV 90E, EPS 50, EL ENG 16B, MATH 55, MAT SCI 45, MCELLBI 32, PHYSICS 7C, STAT 20, STAT 21.
10. Technical electives cannot include:
    - Any course taken on a Pass/No Pass basis
    - Courses numbered 24, 39, 84, or 88
    - Any of the following courses: BIO ENG 100, COMPSCI C79, COMPSCI 195, COMPSCI H195, DES INV courses (except DES INV 15, DES INV 90E, DES INV 190E), ENGIN 125, ENGIN 157AC, ENGIN 180, 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.
11. Students can also take STAT C8 or COMPSCI C8 plus the STAT 88 connector to fulfill the statistics prerequisite. Both courses must be taken to satisfy the requirement, although they do not need to be taken in the same semester. STAT C8 or COMPSCI C8 will also fulfill the three units of lower division coursework that can count toward the ME Tech Elective requirement.
12. M.E.T. Special Topics courses will count as upper division business units.
13. Students must complete a minimum of 38 units of upper division business coursework. See UGBA Elective course list under “Major Requirements (p. 1)” tab.

## Mechanical Engineering

**LEARNING GOALS**

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
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.

Business Administration
MISSION
Guided by the missions of the undergraduate program, and the University’s mission of teaching, research, and service, the mission of the Haas School of Business is to develop leaders who redefine how we do business.

The Haas School of Business Undergraduate Program has developed student learning goals for the Business major that provide faculty and students with a shared understanding of the purpose of the major as well as what graduating seniors are expected to know or to be able to do at the end of their course of study as it relates to the school’s mission.

The learning goals are assessed to determine whether students are achieving the outcomes. The assessment results are used to inform curricular design and other program offerings. All steps require input and participation from the business school community, particularly the faculty. The resulting learning goals, which have their origin in the core curriculum, were shaped over several months by faculty and administration and are listed below.

LEARNING GOALS
1. Students will be skilled in critical thinking and decision making, as supported by the appropriate use of analytical and quantitative techniques.
2. Students will apply functional area concepts and theories appropriately.
3. Students will be effective communicators who can prepare and deliver oral and written presentations using appropriate technologies.
4. Students will be sensitive to the ethical requirements of business activities.
5. Students will tackle strategic and organizational challenges with innovative solutions.

For a visual representation of the relationship between the core curriculum and the expected outcomes, please see the Haas School of Business website (http://www.haas.berkeley.edu/Undergrad/learninggoals.html).

Expand all course descriptions [+]Collapse all course descriptions [-]
MEC ENG 24 Freshman Seminars 1 Unit
Terms offered: Fall 2017, Spring 2017, Fall 2016
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: Summer 2019 10 Week Session, Spring 2019, Fall 2018
This course introduces the fundamentals of energy storage, thermophysical properties of liquids and gases, and the basic principles of thermodynamics which are then applied to various areas of engineering related to energy conversion and air conditioning.
Thermodynamics: Read More [+]
Rules & Requirements
Prerequisites: Chemistry 1A, Engineering 7, Mathematics 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: Spring 2019, Fall 2018, Spring 2018
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 2019 8 Week Session, Summer 2018 8 Week Session, Summer 2016, Summer 2016 10 Week Session
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: Mathematics 53 and 54 (may be taken concurrently); Physics 7A

Credit Restrictions: Students will receive no credit for Mechanical Engineering W85/Civil and Environmental Engineering W30 after completing Mechanical Engineering C85/Civil and Environmental Engineering C30. A deficient grade in Mechanical Engineering C85/Civil and Environmental Engineering C30 may be removed by taking Mechanical Engineering W85/Civil and Environmental Engineering W30.

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 2019, Fall 2016, Summer 2016 10 Week Session
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.
MEC ENG 100 Electronics for the Internet of Things 4 Units

Terms offered: Not yet offered
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: combinational 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: Engineering 7, Computer Science 10, Computer Science 61a, Computer Science C8 or equivalent background in computer programming; 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 2019, Spring 2018, Spring 2017

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: Spring 2019, Fall 2018, Spring 2018
Introduction to design and realization of mechatronics systems. Microcomputer 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.

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 of mechatronics systems; know how to design mechanical components such as transmissions, bearings, shafts, and fasteners.

Rules & Requirements
Prerequisites: E 25, E 26 (junior transfers students are exempt from this requirement), E 27, as well as EE 16A or EE 40

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.

MEC ENG 103 Experimentation and Measurements 4 Units
Terms offered: Spring 2019, Fall 2018
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.

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 (i) a knowledge of contemporary issues (j) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Rules & Requirements
Prerequisites: MEC85, ME40, EE 100/EE 49, and ME 109
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 - 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.
Instructors: Johnson, Makiharju, Chen

Experimentation and Measurements: Read Less [-]
MEC ENG 104 Engineering Mechanics II 3 Units
Terms offered: Summer 2019 10 Week Session, Spring 2019, Fall 2018
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.

Rules & Requirements
Prerequisites: C85 and Engineering 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.

MEC ENG 106 Fluid Mechanics 3 Units
Terms offered: Summer 2019 10 Week Session, Spring 2019, Fall 2018
This course introduces the fundamentals and techniques of fluid mechanics with the aim of describing and controlling engineering flows.

Rules & Requirements
Prerequisites: C85 and 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 not required.

MEC ENG 107 Mechanical Engineering Laboratory 3 Units
Terms offered: Spring 2018, Fall 2017, Spring 2017
Experimental investigation of engineering systems and of phenomena of interest to mechanical engineers. Design and planning of experiments. Analysis of data and reporting of experimental results.

Rules & Requirements
Prerequisites: 102A; senior standing

Hours & Format
Fall and/or spring: 15 weeks - 2-2 hours of lecture, 0-1 hours of discussion, and 3-3 hours of laboratory per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
MEC ENG 108 Mechanical Behavior of Engineering Materials 4 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
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

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: C85

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 2 hours of laboratory per week
Summer: 10 weeks - 4.5 hours of lecture, 1.5 hours 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.

Mechanical Behavior of Engineering Materials: Read Less [-]

MEC ENG 109 Heat Transfer 3 Units
Terms offered: Summer 2019 10 Week Session, Spring 2019, Fall 2018
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: 40 and 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 2019 10 Week Session, Spring 2019, Summer 2018 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 2019, Spring 2016, Spring 2015
This course applies methods of statistical continuum mechanics to subcellular biomechanical phenomena ranging from nanoscale (molecular) to microscale (whole cell and cell population) biological processes at the interface of mechanics, biology, and chemistry.

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 subcellular biomechanics and transport phenomena, and (2) ultimately apply these skills to novel biological and biomedical applications

Rules & Requirements

Prerequisites: Math 54; Physics 7A; BioE102 or MEC85 or instructor's consent

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 More [+]

MEC ENG C117 Structural Aspects of Biomaterials 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2016
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.

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 subcellular biomechanics and transport phenomena, and (2) ultimately apply these skills to novel biological and biomedical applications

Rules & Requirements

Prerequisites: Biology 1A, Engineering 45, Civil and Environmental Engineering 130 or 130N or Bioengineering 102, and Engineering 190

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. Final exam not required.
Instructor: Pruitt
Also listed as: BIO ENG C117

Structural Aspects of Biomaterials: Read More [-]
MEC ENG 118 Introduction to Nanotechnology and Nanoscience 3 Units
Terms offered: Spring 2017, Spring 2015, Spring 2013
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.

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.
Instructor: Lin, Sohn

Introduction to Nanotechnology and Nanoscience: Read More [+]

MEC ENG 119 Introduction to MEMS (Microelectromechanical Systems) 3 Units
Terms offered: Fall 2017, Fall 2015, Fall 2013
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.

Rules & Requirements
Prerequisites: EE 16A or EE 40, and Physics 7B

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: Mofrad

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.)

Rules & Requirements
Prerequisites: Mechanical Engineering C85

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
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.

Rules & Requirements
Prerequisites: Mechanical Engineering 108 and Mechanical Engineering C85/Civil Engineering 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.

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. Final exam required.

Instructor: O'Connell , Sohn

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

MEC ENG 130 Design of Planar Machinery 3 Units

Terms offered: Fall 2018, Fall 2017, Fall 2016

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: 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 2019, Spring 2018, Spring 2016

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.

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

(i) 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 53, 54, Physics 7A-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 laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Borrelli

Vehicle Dynamics and Control: Read Less [-]

**MEC ENG 132 Dynamic Systems and Feedback**

**3 Units**

Terms offered: Summer 2019 10 Week Session, Spring 2019, Fall 2018


Objectives Outcomes

Rules & Requirements

Prerequisites: Math 53, 54, Physics 7A-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.

Instructor: Borrelli

Dynamic Systems and Feedback: Read Less [-]
MEC ENG 133 Mechanical Vibrations 3 Units
Terms offered: Spring 2019, Fall 2016, Spring 2014
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.

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: 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.

MEC ENG C134 Feedback Control Systems 4 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
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.

Rules & Requirements

Prerequisites: EE 16A and either ME 132 or EE 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.

MEC ENG 135 Design of Microprocessor-Based Mechanical Systems 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
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.

Rules & Requirements

Prerequisites: Engineering 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
MEC ENG 136 Introduction to Control of Unmanned Aerial Vehicles 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 1998
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: Mechanical Engineering 132 (or equivalent, taken simultaneously). Recommended: Mechanical Engineering 104 (or equivalent)

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 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: EE 16A or 40, Physics 7B, ME 106, (ME119 or ME118 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. Final exam not required.

Instructor: Fernández-Pello, Chen

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

MEC ENG 140 Combustion Processes 3 Units
Terms offered: Fall 2018, Fall 2016, Fall 2015
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: 40, 106, and 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: 40, 106, and 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; 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.

Rules & Requirements
Prerequisites: 40, 106, and 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.

MEC ENG 151A Conductive and Radiative Transport 3 Units
Terms offered: Fall 2018

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 (Mechanical Engineering 40, Mechanical Engineering 106 and Mechanical Engineering 109 or equivalent). 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 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 near 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
(b) 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 (Mechanical Engineering 40, Mechanical Engineering 106 and Mechanical Engineering 109 or equivalent). 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 154 Thermophysics for Applications 3 Units

Terms offered: Spring 2019

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) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to communicate effectively

Students will learn about the statistical foundation of thermodynamics, including the Boltzmann distribution and partition functions, and will develop skills to perform advanced calculations for analysis of advanced energy conversion processes and devices.

Rules & Requirements

Prerequisites: Mechanical Engineering 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 2019
Lectures on new developments in ocean, offshore, and arctic engineering.
Objectives
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.

MEC ENG 163 Engineering Aerodynamics 3
Units
Terms offered: Fall 2018, Fall 2016, Fall 2014
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.
Rules & Requirements
Prerequisites: 106

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.
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.
MEC ENG 165 Ocean-Environment Mechanics 3 Units
Terms offered: Spring 2018, Spring 2017, Fall 2015

Rules & Requirements
Prerequisites: 106 or Civil and Environmental Engineering 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

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.

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

Ocean-Environment Mechanics: Read More [+]
Microscale Fluid Mechanics: Read More [+]
Ocean-Environment Mechanics: Read Less [-]
Microscale Fluid Mechanics: Read Less [-]
MEC ENG 168 Mechanics of Offshore Systems 3 Units
Terms offered: Spring 2019, Fall 2017, Fall 2015
This course covers major aspects of offshore engineering including ocean environment, loads on offshore structures, cables and mooring, underwater acoustics and arctic operations.
Objectives:
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: Mechanical Engineering 106 and Mechanical Engineering C85 (or Civil Engineering C30). Mechanical Engineering 165 is 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.
Instructor: Alam

MEC ENG 170 Engineering Mechanics III 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
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.
Rules & Requirements
Prerequisites: 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

MEC ENG 173 Fundamentals of Acoustics 3 Units
Terms offered: Spring 2017, Spring 2013, Spring 2011
Rules & Requirements
Prerequisites: 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
MEC ENG 175 Intermediate Dynamics 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
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.

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.

MEC ENG C178 Designing for the Human Body 4 Units
Terms offered: 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., prosthetics 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.

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
(l) 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: Proficiency in MATLAB or equivalent. Prior knowledge of biology or anatomy is not assumed.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate

MEC ENG C180 Engineering Analysis Using the Finite Element Method 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
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.

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 185 Introduction to Continuum Mechanics 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
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 subfields, including Fluid Mechanics, Solid Mechanics and Heat Transfer.

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, as well as 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: 132 or Electrical Engineering 128 (El Engineering 20 may suffice) 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: 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: 132 or Electrical Engineering 128 (EE 20 may suffice) 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: Summer 2019 First 6 Week Session, Summer 2019 Second 6 Week Session, Spring 2019
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: English R1A-R1B or equivalent

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 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.

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 More [+]

MEC ENG 193B Special Topics in Controls 1 - 4 Units
Terms offered: 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.

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 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 2019, Spring 2018, Spring 2017
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.
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

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.
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
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: Prior to 2007
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

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: Spring 2019, Fall 2018, Spring 2016
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: Spring 2019, Spring 2016, Fall 2015
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 2019, Spring 2018, Fall 2017
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.
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.

MEC ENG 199 Supervised Independent Study 1 - 4 Units
Terms offered: Spring 2018, Spring 2017, Summer 2016 8 Week Session
Supervised independent study. Enrollment restrictions apply; see the introduction to Courses and Curricula section of this catalog.
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.

MEC ENG C200 Design, Evaluate, and Scale Development Technologies 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
This required course for the Designated Emphasis in Development Engineering will include projects and case studies, many related to projects at UC Berkeley, such as those associated with the Development Impact Labs (DIL). Student teams will work with preliminary data to define the problem. They will then collect and analyze interview and survey data from potential users and begin to design a solution. Students will explore how to use novel monitoring technologies and “big data” for product improvement and evaluation. The student teams will use the case studies (with improvements based on user feedback and data analysis) to develop a plan for scaling and evaluation with a rigorous controlled trial.

Objectives Outcomes
Course Objectives:
Students will use multiple qualitative and quantitative methods to learn about user needs, to come up with new concepts and solutions, and to understand how new products and services achieve or fail to achieve their goals in a development setting.
Student Learning Outcomes:
Students will be able to apply the skills to current challenges in development engineering
Students will develop a set of skills that will allow them to flourish in a climate of complex problem solving and design challenges in development engineering
Students will learn how to learn from users using qualitative and quantitative tools including surveys, interviews, new monitoring technologies, statistical analyses and experimental designs
Students will learn to participate in and lead innovation and creativity in collaborative settings

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Agogino, Levine
Also listed as: DEV ENG C200

Design, Evaluate, and Scale Development Technologies: Read Less [-]
MEC ENG C201 Modeling and Simulation of Advanced Manufacturing Processes 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
This course provides the student with a modern introduction to the basic industrial practices, modeling techniques, theoretical background, and computational methods to treat classical and cutting edge manufacturing processes in a coherent and self-consistent manner.
Modeling and Simulation of Advanced Manufacturing Processes: Read More [+]
**Objectives Outcomes**

**Course Objectives:** An introduction to modeling and simulation of modern manufacturing processes.

**Rules & Requirements**

**Prerequisites:** An undergraduate course in strength of materials or 122

**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/Graduate

**Grading:** Letter grade.

**Instructor:** Zohdi

**Also listed as:** MAT SCI C286

Modeling and Simulation of Advanced Manufacturing Processes: Read Less [-]

MEC ENG C202 Computational Design of Multifunctional/Multiphysical Composite Materials 3 Units
Terms offered: Spring 2012
The course is self-contained and is designed in an interdisciplinary manner for graduate students in engineering, materials science, physics, and applied mathematics who are interested in methods to accelerate the laboratory analysis and design of new materials. Examples draw primarily from various mechanical, thermal, diffusive, and electromagnetic applications.
Computational Design of Multifunctional/Multiphysical Composite Materials: Read More [+]

**Rules & Requirements**

**Prerequisites:** An undergraduate degree in the applied sciences or engineering

**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/Graduate

**Grading:** Letter grade.

**Instructor:** Zohdi

**Also listed as:** MAT SCI C287

Computational Design of Multifunctional/Multiphysical Composite Materials: Read Less [-]
MEC ENG 203 Nanoscale Processing of Materials 3 Units
Terms offered: Prior to 2007
This course surveys sub-micrometer pattern-transfer techniques and methods for handling materials with one or more sub-micrometer dimensions. The optical and mechanical principles underlying a spectrum of candidate lithography techniques are introduced, and extensive examples of industrial applications are discussed. Class material also covers techniques for assembling structures from zero-, one- and two-dimensional materials including nanoparticles, nanotubes, nanowires, and single- and few-atomic-layer sheets of van der Waals solids such as graphene and molybdenite.

Objective Outcomes
Course Objectives: The objectives of the course are to:
• Make students aware of current capabilities and innovations in sub-micrometer lithography and in the handling of nanoscale materials;
• Equip students to select an appropriate lithography or processing technique for a given application from among multiple alternatives;
• Provide students with an understanding of the transformations of material that occur in sub-micrometer lithography techniques, such that they can understand why certain processing routes might be preferable to others for particular applications.

Student Learning Outcomes: • Articulate the key requirements (i.e. resolution, maximum defect density, and multi-layer alignment precision) of micro- and nano-patterning processes to be used in a range of applications, such as semiconductors, hard disk-drives, large-area photovoltaics, and biomedical microdevices.
• Identify which of a set of available micro-/nano-patterning processes (e.g. extreme-UV lithography, directed self-assembly, multiple e-beam lithography, and imprint lithography) are suitable for a given patterning application.
• Accurately explain and distinguish between the physical transformations of material that occur in a number of sub-micrometer patterning processes, including imprint lithography, micro-contact printing, micro-embossing, and micro-gravure.
• Identify a number of currently open research questions relating to nanoscale processing of materials and suggest possible creative solutions to them.
• Use numerical simulation techniques to model the behavior of one or more lithographic techniques, including nanoimprint, photolithography, or electron-beam lithography. Use insights from modeling to optimize key process parameters and to make trade-offs in the geometrical design of a pattern that is to be fabricated.

Rules & Requirements
Prerequisites: An understanding of solid mechanics and statics, or permission of instructor. Experience programming in Matlab is desirable for simulation assignments.

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

Advanced Manufacturing Systems Analysis, AMS 3 Units
Terms offered: Spring 2017, Spring 2016, Spring 2015
This course is designed to prepare students for technical leadership in industry. The objective is to provide insight and understanding on the main concepts and practices involved in analyzing, managing systems to deliver high quality, cost effectiveness and sustainable advantages. The impact of this class on the Mechanical Engineering program includes delivering core production concepts and advanced skills that blend vision and advanced manufacturing elements. This course is highly recommended for students on the Product Design track in Mechanical Engineering's Master of Engineering program.

Objective Outcomes
Course Objectives: The objective of this course is to ensure that our students:
• Gain solid foundations on the analysis of Advanced Manufacturing Systems Analysis (AMS), including flow analysis concepts, frameworks and methodologies.
• Understand and apply sustainable engineering practices.
• Put into practice decision-making activities based on solid academic rigor, quantitative tools and simulation models oriented for AMS.
• Align their AMS to a company’s strategy to deliver business advantage.

Rules & Requirements
Prerequisites: This course is open to graduate students, with priority given to students in Mechanical Engineering’s Master of Engineering program.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Taylor
MEC ENG C205 Critical Making 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Critical Making will operationalize and critique the practice of “making” through both foundational literature and hands on studio culture. As hybrid practitioners, students will develop fluency in readily collaging and incorporating a variety of physical materials and protocols into their practice. Students will envision and create future computational experiences that critically explore social and culturally relevant technological themes. No previous technical knowledge is required to take this course. Class projects involve basic programming, electronic circuitry, and digital fabrication design. Tutorials and instruction will be provided, but students will be expected to develop basic skills in these areas to complete course projects.
Critical Making:  Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture and 2 hours of studio per week
Summer:
6 weeks - 4 hours of lecture and 8 hours of studio per week
8 weeks - 4 hours of lecture and 4 hours of studio per week
10 weeks - 3 hours of lecture and 3 hours of studio per week

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Formerly known as: New Media 203
Also listed as: NWMEDIA C203
Critical Making: Read Less [-]

MEC ENG 206 Engineering Design and Prototyping: Pedagogy & Assessment 3 Units
Terms offered: Prior to 2007
This course explores contemporary research in engineering design and prototyping, as well as related cognitive issues in engineering curricular development, pedagogy, and assessment. One recurring theme throughout the course will be the duality between learning and design: design-based research, design as a pedagogy for integrative learning and the role of cognition and the learning sciences in the practice of engineering design. It has been motivated by several reforms: (1) National efforts to better train and educate engineers for the engineering workplace in the 21st Century: to better prepare engineers to face multidisciplinary problems and product design in competitive industries and improve their skills in teamwork and communication.

Engineering Design and Prototyping: Pedagogy & Assessment:  Read More [+]

Objectives Outcomes
Course Objectives: This course has been developed to bridge student’s previous knowledge of disciplinary research in design and prototyping with engineering education research.

• Provide learners the opportunity to question (usually tacit) assumptions about what engineering is, what the purpose and process of engineering education is, and who gets to be an engineer.
• Understand design as a pedagogy for integrative learning and the role of cognition and the learning sciences in the practice of engineering design and prototyping.
• Provide the participants with an understanding of theories and practices in content, assessment, and pedagogy for teaching engineering design and prototyping.
• Familiarize learners with quantitative and qualitative methodologies for data analysis associated with the assessment of design and prototyping interventions.
• Promote critical thinking and a social construction of knowledge by having face-to-face and online discussions of readings from a variety of sources.

Student Learning Outcomes: Students will be able to:
• Identify their own role in shaping engineering and engineering education, and explore paths of connecting their research in Mechanical Engineering (or a related field) educational interests in design and prototyping;
• Think critically, reflectively and holistically about engineering and education;
• Become aware of the theoretical and practical issues of learning, instruction, and assessment as these concern the design of educational environments and technologies;
• Apply design research methods to inform and validate designs involving educational issues.
• Articulate their own view of the design of educational tools and become more confident about their ability to work as an engineer and educational designer.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Agogino

Engineering Design and Prototyping: Pedagogy & Assessment: Read More [-]
MEC ENG C210 Advanced Orthopedic Biomechanics 4 Units
Terms offered: Spring 2019, Fall 2017, Fall 2016
Students will learn the application of engineering concepts including statics, dynamics, optimization theory, composite beam theory, beam-on-elastic foundation theory, Hertz contact theory, and materials behavior. Topics will include 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. Students will be challenged in a MATLAB-based project to integrate the course material in an attempt to gain insight into contemporary design/analysis/problems.

Objectives Outcomes
Course Objectives: The purpose of this course is twofold:
• to learn the fundamental concepts of orthopaedic biomechanics;
• to enhance skills in mechanical engineering and bioengineering by analyzing the mechanical behavior of various complex biomedical problems.

Student Learning Outcomes: Working knowledge of various engineering concepts such as composite beam theory, beam-on-elastic-foundation theory, Hertz contact theory and MATLAB-based optimization design analysis. 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.

Rules & Requirements
Prerequisites: ME C85/CE C30 or Bio Eng 102; concurrent enrollment OK. Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed

Credit Restrictions: Students will not receive credit for this course if they have taken ME C176/Bio E C119.

MEC ENG 211 The Cell as a Machine 3 Units
Terms offered: Fall 2015, Fall 2013
This course offers a modular and systems mechanobiology (or “machine”) perspective of the cell. Two vitally important components of the cell machinery will be studied in depth: (1) the integrin-mediated focal adhesions system that enables the cell to adhere to, and communicate mechano-chemical signals with, the extracellular environment, and (2) the nuclear pore complex, a multi-protein gateway for traffic in and out of the nucleus that regulates gene expression and affects protein synthesis.

Objectives Outcomes
Course Objectives: The purpose of this course is twofold:
• to learn the fundamental concepts of orthopaedic biomechanics;
• to enhance skills in mechanical engineering and bioengineering by analyzing the mechanical behavior of various complex biomedical problems.

Student Learning Outcomes: Working knowledge of various engineering concepts such as composite beam theory, beam-on-elastic-foundation theory, Hertz contact theory and MATLAB-based optimization design analysis. 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.

Rules & Requirements
Prerequisites: Mathematics 54; Physics 7A; graduate standing

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/Graduate
Grading: Letter grade.
Instructor: Mofrad

MEC ENG C212 Heat and Mass Transport in Biomedical Engineering 3 Units
Terms offered: Spring 2008, Fall 2007, Spring 2006, Spring 2005
Fundamental processes of heat and mass transport in biological systems; organic molecules, cells, biological organs, whole animals. Derivation of mathematical models and discussion of experimental procedures. Applications to biomedical engineering.

Objectives Outcomes
Course Objectives: The purpose of this course is twofold:
• to learn the fundamental concepts of orthopaedic biomechanics;
• to enhance skills in mechanical engineering and bioengineering by analyzing the mechanical behavior of various complex biomedical problems.

Student Learning Outcomes: Working knowledge of various engineering concepts such as composite beam theory, beam-on-elastic-foundation theory, Hertz contact theory and MATLAB-based optimization design analysis. 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.

Rules & Requirements
Prerequisites: ME C85/CE C30 or Bio Eng 102; concurrent enrollment OK. Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed

Credit Restrictions: Students will not receive credit for this course if they have taken ME C176/Bio E C119.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: O'Connell, Keaveny

Also listed as: BIO ENG C209

Advanced Orthopedic Biomechanics: Read More [+]

MEC ENG 211 The Cell as a Machine: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 54; Physics 7A; graduate standing

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/Graduate
Grading: Letter grade.
Instructor: Mofrad

The Cell as a Machine: Read Less [-]

MEC ENG C212 Heat and Mass Transport in Biomedical Engineering: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 54; Physics 7A; graduate standing

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: O'Connell, Keaveny

Also listed as: BIO ENG C209

Advanced Orthopedic Biomechanics: Read Less [-]

Heat and Mass Transport in Biomedical Engineering: Read Less [-]
MEC ENG C213 Fluid Mechanics of Biological Systems 3 Units
Terms offered: Spring 2019, Spring 2016, Spring 2014
Fluid mechanical aspects of various physiological systems, the circulatory, respiratory, and renal systems. Motion in large and small blood vessels. Pulsatile and peristaltic flows. Other biofluidmechanical flows: the ear, eye, etc. Instrumentation for fluid measurements in biological systems and for medical diagnosis and applications. Artificial devices for replacement of organs and/or functions, e.g. blood oxygenators, kidney dialysis machines, artificial hearts/circulatory assist devices.
Fluid Mechanics of Biological Systems: Read More [+]
Rules & Requirements
Prerequisites: 106 or equivalent; 265A or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Berger, Liepmann
Also listed as: BIO ENG C213
Fluid Mechanics of Biological Systems: Read Less [-]

MEC ENG C214 Advanced Tissue Mechanics 3 Units
Terms offered: Spring 2018, Spring 2017, Spring 2015
The goal of this course is to provide a foundation for characterizing and understanding the mechanical behavior of load-bearing tissues. A variety of mechanics topics will be introduced, including anisotropic elasticity and failure, cellular solid theory, biphasic theory, and quasi-linear viscoelasticity (QLV) theory. Building from this theoretical basis, we will explore the constitutive behavior of a wide variety of biological tissues. After taking this course, students should have sufficient background to independently study the mechanical behavior of most biological tissues. Formal discussion section will include a seminar series with external speakers.
Advanced Tissue Mechanics: Read More [+]
Rules & Requirements
Prerequisites: 102A, 176, 185; graduate standing 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/Graduate
Grading: Letter grade.
Instructors: Berger, Liepmann
Also listed as: BIO ENG C214
Advanced Tissue Mechanics: Read Less [-]

MEC ENG C215 Advanced Structural Aspects of Biomaterials 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2016
This course covers the structure and mechanical functions of load bearing tissues and their replacements. Biocompatibility of biomaterials and host response to structural implants are examined. Quantitative treatment of biomechanical issues and constitutive relationships of materials are covered in order to design implants for structural function. Material selection for load bearing applications including reconstructive surgery, orthopedics, dentistry, and cardiology are addressed.
Advanced Structural Aspects of Biomaterials: Read More [+]
Rules & Requirements
Credit Restrictions: Students should not receive credit if they’ve taken ME ME C117 or Bio Eng C117.
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/Graduate
Grading: Letter grade.
Instructors: Berger, Liepmann
Also listed as: BIO ENG C222
Advanced Structural Aspects of Biomaterials: Read Less [-]
MEC ENG C216 Molecular Biomechanics and Mechanobiology of the Cell 4 Units
Terms offered: Spring 2019, Spring 2016, Spring 2015
This course develops and applies scaling laws and the methods of continuum and statistical mechanics to understand micro- and nano-scale mechanobiological phenomena involved in the living cell with particular attention the nucleus and the cytoskeleton as well as the interactions of the cell with the extracellular matrix and how these interactions may cause changes in cell architecture and biology, consequently leading to functional adaptation or pathological conditions.

Objectives Outcomes

Course Objectives: This course, which is open to 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 subcellular biomechanics and transport phenomena, and (2) ultimately apply these skills to novel biological and biomedical applications.

Rules & Requirements

Prerequisites: Math 54; Physics 7A; BioE 102 or ME C85 or instructor’s consent

Hours & Format

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

MEC ENG C217 Biomimetic Engineering -- Engineering from Biology 3 Units
Terms offered: Fall 2017, Spring 2014, Fall 2010
Study of nature's solutions to specific problems with the aim of determining appropriate engineering analogs. Morphology, scaling, and design in organisms applied to engineering structures. Mechanical principles in nature and their application to engineering devices. Mechanical behavior of biological materials as governed by underlying microstructure, with the potential for synthesis into engineered materials. Trade-offs between redundancy and efficiency. Students will work in teams on projects where they will take examples of designs, concepts, and models from biology and determine their potential in specific engineering applications.

Objectives Outcomes

Course Objectives: This course, which is open to 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 subcellular biomechanics and transport phenomena, and (2) ultimately apply these skills to novel biological and biomedical applications.

Rules & Requirements

Prerequisites: Graduate standing in engineering or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate

Grading: Letter grade.

Instructor: Dharan

Also listed as: BIO ENG C217/INTEGBI C217

Molecular Biomechanics and Mechanobiology of the Cell: Read More [+]
MEC ENG C218 Introduction to MEMS Design
4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Physics, fabrication, and design of micro-electromechanical systems (MEMS). Micro and nanofabrication processes, including silicon surface and bulk micromachining and non-silicon micromachining. Integration strategies and assembly processes. Microsensor and microactuator devices: electrostatic, piezoresistive, piezoelectric, thermal, magnetic transduction. Electronic position-sensing circuits and electrical and mechanical noise. CAD for MEMS. Design project is required.
Introduction to MEMS Design: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing in engineering or science; undergraduates with 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/Graduate
Grading: Letter grade.
Instructors: Nguyen, Pister
Formerly known as: Electrical Engineering C245, Mechanical Engineering C218
Also listed as: EL ENG C247B

Introduction to MEMS Design: Read Less [-]

MEC ENG C219 Parametric and Optimal Design of MEMS 3 Units
Terms offered: Spring 2013, Spring 2012, Spring 2011
Parametric design and optimal design of MEMS. Emphasis on design, not fabrication. Analytic solution of MEMS design problems to determine the dimensions of MEMS structures for specified function. Trade-off of various performance requirements despite conflicting design requirements. Structures include flexure systems, accelerometers, and rate sensors.
Parametric and Optimal Design of MEMS: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Lin, Pisano
Formerly known as: 219
Also listed as: EL ENG C246

Parametric and Optimal Design of MEMS: Read Less [-]

MEC ENG 220 Precision Manufacturing 3 Units
Terms offered: Fall 2015, Fall 2013, Fall 2012
Introduction to precision engineering for manufacturing. Emphasis on design and performance of precision machinery for manufacturing. Topics include machine tool elements and structure, sources of error (thermal, static, dynamic, process related), precision machining processes and process models (diamond turning and abrasive (fixed and free) processes), sensors for process monitoring and control, metrology, actuators, machine design case studies and examples of precision component manufacture.
Precision Manufacturing: Read More [+]

Rules & Requirements
Prerequisites: 101, 102B, or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Dornfeld
Precision Manufacturing: Read Less [-]
MEC ENG C220D Input/Output Methods for Compositional System Analysis 2 Units
Terms offered: Prior to 2007
Introduction to input/output concepts from control theory, systems as
operators in signal spaces, passivity and
small-gain theorems, dissipativity theory, integral quadratic constraints.
Compositionally stable and
performance certification for interconnected systems from subsystems
input/output properties. Case studies in
multi-agent systems, biological networks, Internet congestion control, and
adaptive control.

Objectives Outcomes
Course Objectives: Standard computational tools for control synthesis
and verification do not scale well to large-scale, networked
systems in emerging applications. This course presents a compositional
methodology suitable when the
subsystems are amenable to analytical and computational methods but
the interconnection, taken as a whole, is
beyond the reach of these methods. The main idea is to break up the
task of certifying desired stability and
performance properties into subproblems of manageable size using input/
output properties. Students learn about
the fundamental theory, as well as relevant algorithms and applications in
several domains.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Arcak, Packard
Also listed as: EL ENG C220D

MEC ENG 221 Graduate Introduction to Lean Manufacturing Systems 3 Units
Terms offered: Spring 2019, Spring 2018, Fall 2006
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.

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: Graduate standing in Engineering, or consent of instructor
Credit Restrictions: Students will not receive credit for this course after
taking ME 101.

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/Graduate
Grading: Letter grade.
Instructor: McMains

Graduate Introduction to Lean Manufacturing Systems: Read Less [-]
MEC ENG C223 Polymer Engineering 3 Units
Terms offered: Fall 2017, Fall 2015, Fall 2014
A survey of the structure and mechanical properties of advanced engineering polymers. Topics include rubber elasticity, viscoelasticity, mechanical properties, yielding, deformation, and fracture mechanisms of various classes of polymers. The course will discuss degradation schemes of polymers and long-term performance issues. The class will include polymer applications in bioengineering and medicine.

Rules & Requirements
Prerequisites: Civil Engineering 130, Engineering 45

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/Graduate
Grading: Letter grade.

Also listed as: BIO ENG C223
Polymer Engineering: Read More [+]

MEC ENG 224 Mechanical Behavior of Engineering Materials 3 Units
Terms offered: Fall 2018, Fall 2016, Fall 2015
This course covers elastic and plastic deformation under static and dynamic loads. Prediction and prevention of failure by yielding, fracture, fatigue, creep, corrosion, and wear. Basic elasticity and plasticity theories are discussed.

Rules & Requirements
Prerequisites: Civil and Environmental Engineering 130 or 130N; Engineering 45

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/Graduate
Grading: Letter grade.

Mechanical Behavior of Engineering Materials: Read Less [-]

MEC ENG C225 Deformation and Fracture of Engineering Materials 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2016
This course covers deformation and fracture behavior of engineering materials for both monotonic and cyclic loading conditions.

Rules & Requirements
Prerequisites: Civil Engineering 130, Engineering 45

Hours & Format
Fall and/or spring: 15 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Ritchie, Pruitt, Komvopoulos
Formerly known as: Materials Science and Engineering C212, Mechanical Engineering C225
Also listed as: MAT SCI C212
Deformation and Fracture of Engineering Materials: Read Less [-]

MEC ENG 226 Tribology 3 Units
Terms offered: Spring 2019, Fall 2016, Spring 2016

Rules & Requirements
Prerequisites: 102B, 104, 108

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Komvopoulos
Tribology: Read Less [-]
MEC ENG 227 Mechanical Behavior of Composite Materials 3 Units
Terms offered: Spring 2013, Fall 2010, Fall 2008
Mechanical Behavior of Composite Materials: Read More [+]
Rules & Requirements
Prerequisites: Graduate standing or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Dharan
Mechanical Behavior of Composite Materials: Read Less [-]

MEC ENG 229 Design of Basic Electro-Mechanical Devices 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Fundamental principles of magnetics, electro-magnetics, and magnetic materials as applied to design and operation of electro-mechanical devices. Type of device to be used in a particular application and dimensions of parts for the overall design will be discussed. Typical applications covered will be linear and rotary actuators, stepper motors, AC motors, and DC brush and brushless motors. A design project is required.
Design of Basic Electro-Mechanical Devices: Read More [+]
Rules & Requirements
Prerequisites: EECS 100, graduate standing or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Borrelli
Design of Basic Electro-Mechanical Devices: Read Less [-]

MEC ENG 230A Predictive Control 2 Units
Terms offered: Fall 2018
Advanced optimization, polyhedra manipulation, and multiparametric programming. Robust Invariant set theory. Analysis and design of model predictive controllers (MPC) for linear and nonlinear systems. Stochastic MPC. Learning MPC. Computational oriented models of hybrid systems. Analysis and design of constrained predictive controllers for hybrid systems.
Predictive Control: Read More [+]
Objectives Outcomes
Course Objectives: The course is designed for graduate students who want to expand their knowledge on model predictive control. 80% will be focusing on advanced theory. 20% on applications.
Student Learning Outcomes: At the end of the course, the students will write a theoretical paper on MPC and/or will design an application where the advanced theory is implemented.
Rules & Requirements
Prerequisites: ME C232 and ME C231A
Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Borrelli
Predictive Control: Read Less [-]
MEC ENG 230B Advanced System Theory: Control-Oriented Robustness Analysis 2 Units
Terms offered: Prior to 2007
Theoretical development of the common methods in control system robustness analysis, including general dissipative systems and supply rates, structured singular value, and integral quadratic constraints. Transforming theory into pragmatic algorithms. Use cases in industrial examples.

Advanced System Theory: Control-Oriented Robustness Analysis: Read More [+]  

Objectives Outcomes

Course Objectives: The course is designed for graduate students who want to quickly expand their knowledge on robustness analysis comprising one part of a complete validation process for complex feedback systems. Students will learn about theory, algorithms, applications and existing software.

Student Learning Outcomes: Students will gain a deep understanding of the modeling assumptions and precise results offered by current state-of-the-art robustness analysis techniques. The wide applicability as well as the limitations of the techniques will be emphasized. The course concludes with a self-directed project, covering a theoretical, algorithmic or applications-oriented issue of interest to each individual student.

Rules & Requirements

Prerequisites: Basic graduate background in linear algebra and linear differential equations (ME C232 or EECS 221A or equivalent)

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Packard

Advanced System Theory: Control-Oriented Robustness Analysis: Read Less [-]

MEC ENG C231A Experiential Advanced Control Design I 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
Experience-based learning in the design of SISO and MIMO feedback controllers for linear systems. The student will master skills needed to apply linear control design and analysis tools to classical and modern control problems. In particular, the participant will be exposed to and develop expertise in two key control design technologies: frequency-domain control synthesis and time-domain optimization-based approach.

Experiential Advanced Control Design I: Read More [+]  

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/Graduate
Grading: Letter grade.
Also listed as: EL ENG C220B

Experiential Advanced Control Design I: Read Less [-]

MEC ENG C231B Experiential Advanced Control Design II 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Experience-based learning in the design, analysis, and verification of automatic control systems. The course emphasizes the use of computer-aided design techniques through case studies and design tasks. The student will master skills needed to apply advanced model-based control analysis, design, and estimation to a variety of industrial applications. The role of these specific design methodologies within the larger endeavor of control design is also addressed.

Experiential Advanced Control Design II: Read More [+]  

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/Graduate
Grading: Letter grade.
Also listed as: EL ENG C220C

Experiential Advanced Control Design II: Read Less [-]
MEC ENG C232 Advanced Control Systems I 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
Advanced Control Systems I: Read More [+]

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

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/Graduate
Grading: Letter grade.
Instructors: Borrelli, Horowitz, Tomizuka, Tomlin
Also listed as: EL ENG C220A
Advanced Control Systems I: Read Less [-]

MEC ENG 233 Advanced Control Systems II 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Linear Quadratic Optimal Control, Stochastic State Estimation, Linear Quadratic Gaussian Problem, Loop Transfer Recovery, Adaptive Control and Model Reference Adaptive Systems, Self Tuning Regulators, Repetitive Control, Application to engineering systems.
Advanced Control Systems II: Read More [+]

Rules & Requirements
Prerequisites: 232

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Packard, Poolla
Advanced Control Systems II: Read Less [-]

MEC ENG 234 Multivariable Control System Design 3 Units
Terms offered: Fall 2016, Spring 2015, Spring 2011
Analysis and synthesis techniques for multi-input (MIMO) control systems. Emphasis is on the effect that model uncertainty has on the design process.
Multivariable Control System Design: Read More [+]

Rules & Requirements
Prerequisites: 232 or EECS 221A, as well as firm foundation in classical control

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Tomizuka, Horowitz
Multivariable Control System Design: Read Less [-]

MEC ENG 235 Design of Microprocessor-Based Mechanical Systems 4 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
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: 132, or C134/Electrical Engineering and Computer Science C128, or any basic undergraduate course in controls

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

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/Graduate
Grading: Letter grade.
Design of Microprocessor-Based Mechanical Systems: Read Less [-]
MEC ENG 236U Control and Dynamics of Unmanned Aerial Vehicles 3 Units

Terms offered: Not yet offered
This course is a room share with ME136, and teaches students the dynamic analysis and control of unmanned aerial vehicles (UAVs). The course covers modeling and dynamics of aerial vehicles, common control strategies, sensing and estimation. A laboratory sequence allows students to apply knowledge on a real quadcopter system, by programming a microcontroller to control a UAV.

Control and Dynamics 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.

Rules & Requirements

Prerequisites: Introductory control (Mechanical Engineering 132 or similar), Dynamics (Mechanical Engineering 104 or similar). Taken concurrently: a graduate controls class (Mechanical Engineering C232/Electrical Engineering C220A or similar)

Credit Restrictions: Student will not receive credit for this course if they have taken Mechanical Engineering 136.

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/Graduate

Grading: Letter grade.

Instructor: Mueller

Control and Dynamics of Unmanned Aerial Vehicles: Read Less [-]

MEC ENG C236 Control and Optimization of Distributed Parameters Systems 3 Units

Terms offered: Fall 2017, Spring 2016, Spring 2015, Spring 2014


Control and Optimization of Distributed Parameters Systems: Read More [+]

Rules & Requirements

Prerequisites: Engineering 77, Mathematics 54 (or equivalent), or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate

Grading: Letter grade.

Also listed as: CIV ENG C291F/EL ENG C291

Control and Optimization of Distributed Parameters Systems: Read Less [-]
MEC ENG 237 Control of Nonlinear Dynamic Systems 3 Units
Terms offered: Spring 2016, Spring 2015, Fall 2013

Objectives Outcomes
Course Objectives: To develop non-simulative/analytical tools to predict the stability and performance of nonlinear systems and to develop an appreciation for the differences between linear and nonlinear systems such as multiple equilibrium points, initial condition dependent stability. To develop controller synthesis methods for nonlinear and uncertain dynamic systems.

Student Learning Outcomes: The ability to design, evaluate and implement closed loop controllers for highly nonlinear and uncertain systems.

Rules & Requirements
Prerequisites: ME C232

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/Graduate
Grading: Letter grade.

Instructors:
Arcak, Tomlin, Kameshwar

MEC ENG 237 Nonlinear Systems 3 Units
Terms offered: Spring 2019, Spring 2018

Objectives Outcomes
Prerequisites: Math 54, or equivalent (undergraduate level Ordinary Differential Equations and Linear Algebra)

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.

Instructors: Arcak, Tomlin, Kameshwar

Also listed as: EL ENG C222
Nonlinear Systems: Read Less [-]

MEC ENG 238 Advanced Micro/Nano Mechanical Systems Laboratory 3 Units
Terms offered: Spring 2018, Spring 2013
This hands-on laboratory course focuses on the mechanical engineering principles that underlie the design, fabrication, 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.

Objectives Outcomes
Prerequisites: EE 16A or 40, Physics 7B, ME 106, (ME119 or ME118 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/Graduate
Grading: Letter grade.

Instructors:
Advanced Micro/Nano Mechanical Systems Laboratory: Read Less [-]
MEC ENG 239 Advanced Design and Automation 4 Units
Terms offered: Fall 2018, Fall 2014, Spring 2013
This course will provide students with a solid understanding of smart products and the use of embedded microcomputers in products and machines. The course has two components: 1.) Formal lectures. Students receive a set of formal lectures on the design of smart machines and products that use embedded microcomputers. The materials cover machine components, actuators, sensors, basic electronic devices, embedded microprocessor systems and control, power transfer components, and mechanism design. 2.) Projects. Students will design and construct prototype products that use embedded microcomputers.

Rules & Requirements
Prerequisites: Graduate standing in engineering or science and one course in Control

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/Graduate
Grading: Letter grade.
Instructor: Kazerooni

MEC ENG 240A Advanced Marine Structures I 3 Units
Terms offered: Fall 2013, Spring 2013, Spring 2012
This course introduces a probabilistic description of ocean waves and wave loads acting on marine structures. These topics are followed with discussion of structural strength and reliability analysis.

Rules & Requirements
Prerequisites: Graduate standing; Statistics 25 or equivalent

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Mansour

MEC ENG 240B Advanced Marine Structures II 3 Units
Terms offered: Spring 2015, Fall 2014, Spring 2014
This course is concerned with the structural response of marine structures to environmental loads. Overall response of the structure as well as the behavior of its members under lateral and compressive loads are discussed.

Rules & Requirements
Prerequisites: Consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Mansour

Advanced Marine Structures II: Read Less [-]
MEC ENG 241A Marine Hydrodynamics I 3 Units
Terms offered: Fall 2016, Fall 2015, Spring 2014
Navier-Stokes Equations. Boundary-layer theory, laminar, and turbulent.
Frictional resistance. Boundary layer over water surface. Separated
flow modeling. Steady and unsteady flow. Momentum theorems. Three-
dimensional water-wave theory. Formulation of wave resistance of ships.
Marine Hydrodynamics I: Read More [+]
Objectives Outcomes

Course Objectives: To provide students with a sufficient introduction to
each of the topics of the course so that he/she will be able to understand
the background of current literature in the hydrodynamics of marine
vehicles, offshore engineering, and other ocean-related activities.

Student Learning Outcomes: Students with ocean- and marine-
related interest will develop the necessary theoretical and experimental
background to keep up with existing literature and begin research on
contemporary topics.

Rules & Requirements

Prerequisites: Mechanical Engineering 165 recommended or graduate
standing

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/Graduate

Grading: Letter grade.

Instructor: Yeung

Marine Hydrodynamics I: Read Less [-]

MEC ENG 241B Marine Hydrodynamics II 3 Units
Terms offered: Spring 2017, Spring 2016, Fall 2014
Momentum analysis for bodies moving in a fluid. Added-mass theory.
Matched asymptotic slender-body theory. Small bodies in a current.
Theory of motion of floating bodies with and without forward speed.
Radiation and diffraction potentials. Wave forces. Hydro-elasticity
formulation. Ocean-wave energy. Memory effects in time domain.
Second-order formulation. Impact hydrodynamics, Hydrofoil theory and
lifting surface.

Marine Hydrodynamics II: Read More [+]
Objectives Outcomes

Course Objectives: To provide students with a sufficient introduction to
each of the topics of the course so that he/she will be able to understand
the background of current literature in the hydrodynamics of marine
vehicles, offshore engineering, and renewable ocean energy

Student Learning Outcomes: Students with ocean- and marine-
related interest will develop the necessary theoretical and experimental
background to keep up with existing literature and begin research on
contemporary topics.

Rules & Requirements

Prerequisites: 260A or 241A, or CEE 200A recommended

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/Graduate

Grading: Letter grade.

Instructor: Yeung

Marine Hydrodynamics II: Read Less [-]
MEC ENG 243 Advanced Methods in Free-Surface Flows 3 Units
Terms offered: Spring 2016, Fall 2012, Spring 2009
Advanced Methods in Free-Surface Flows: Read More [+]

Objectives Outcomes

Course Objectives: To present a relatively broad spectrum of analytical and numerical methods commonly used in tackling wave-body interaction problems. Topics covered include classical techniques in special coordinate systems, modern computational techniques based on boundary-integral, finite-element, and boundary-fitted coordinates methods. Lectures focus on formulations and implementation techniques. Students are given opportunities to implement methods discussed in class on workstations or mainframe.

Student Learning Outcomes: Students will be conversant and have abilities to handle fluid-structure interactions problems with free-surface present.

Rules & Requirements

Prerequisites: ME 260A or CEE 200A; ME 241B recommended or with Instructor’s permission

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/Graduate

Grading: Letter grade.

Instructor: Yeung

Advanced Methods in Free-Surface Flows: Read Less [-]

MEC ENG 245 Oceanic and Atmospheric Waves 3 Units
Terms offered: Spring 2018, Spring 2016, Spring 2015
Covers dynamics of wave propagation in the ocean and the atmosphere. Specifically, formulation and properties of waves over the surface of a homogenous fluid, interfacial waves in a two-/multi-layer density stratified fluid, and internal waves in a continuous stratification will be discussed.
Oceanic and Atmospheric Waves: Read More [+]

Rules & Requirements

Prerequisites: Mechanical Engineering 241A or 241B or 260A or Civil and Environmental Engineering 200A or equivalent courses

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/Graduate

Grading: Letter grade.

Oceanic and Atmospheric Waves: Read Less [-]
MEC ENG 246 Advanced Energy Conversion Principles 3 Units
Terms offered: Fall 2018, Spring 2018, Fall 2016
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. 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.
Advanced Energy Conversion Principles: Read More [+]
Objectives Outcomes
Course Objectives: This class provides students with an understanding of the thermophysical principles that govern energy conversion processes of different types, and will introduce them to modern computational methods for modeling the performance of energy conversion processes, devices and systems. This course is a capstone experience for ME students, synthesizing thermodynamics, fluid dynamics, heat transfer and computational analysis tools to facilitate engineering design analysis.

Student Learning Outcomes: This course will provide a foundation for design analysis of energy conversion systems encountered in a variety of applications.
Rules & Requirements
Prerequisites: Engineering 7, Mechanical Engineering 40, Mechanical Engineering 106, and Mechanical Engineering 109 or their equivalents
Credit Restrictions: Students will receive no credit for Mechanical Engineering 246 after taking Mechanical Engineering 146.

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/Graduate
Grading: Letter grade.
Instructor: Carey
Advanced Energy Conversion Principles: Read Less [-]

MEC ENG 250A Advanced Conductive and Radiative Transport 3 Units
Terms offered: Fall 2018
Advanced 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 (Mechanical Engineering 40, Mechanical Engineering 106 and Mechanical Engineering 109 or equivalent). 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 will not be able to receive credit for this course if they have taken Mechanical Engineering 151, 151A or 251.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Grigoropoulos
Advanced Conductive and Radiative Transport: Read Less [-]
MEC ENG 250B Advanced Convective Transport and Computational Methods 3 Units
Terms offered: 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.
Advanced 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 near 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: 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 (Mechanical Engineering 40, Mechanical Engineering 106 and Mechanical Engineering 109 or equivalent). 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 will not be able to receive credit for this course if they have taken Mechanical Engineering 252.

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Carey

Advanced Convective Transport and Computational Methods: Read Less [-]

MEC ENG 251 Heat Conduction 3 Units
Terms offered: Spring 2018, Fall 2016, Fall 2015
Analytical and numerical methods for the determination of the conduction of heat in solids.

Heat Conduction: Read More [+]

Rules & Requirements

Prerequisites: 151; Engineering 230A

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Greif

Heat Convection: Read Less [-]

MEC ENG 252 Heat Convection 3 Units
Terms offered: Spring 2017, Spring 2015, Spring 2014
The transport of heat in fluids in motion; free and forced convection in laminar and turbulent flow over surfaces and within ducts.

Heat Convection: Read More [+]

Rules & Requirements

Prerequisites: 151, 265A; Engineering 230A

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Greif

Heat Radiation: Read Less [-]

MEC ENG 253 Thermal Radiation 3 Units
Terms offered: Spring 2018, Fall 2015, Fall 2013
Thermal radiation properties of gases, liquids, and solids; the calculation of radiant energy transfer.

Thermal Radiation: Read More [+]

Rules & Requirements

Prerequisites: 151

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Grigoropoulos, Majumdar

Thermal Radiation: Read Less [-]
MEC ENG 254 Thermodynamics I 3 Units
Terms offered: Spring 2019, Spring 2018, Fall 2016
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.

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: Students ability to calculate partition functions, perform equilibrium calculations, and undertake molecular-dynamics and Monte-Carlo simulations of non-equilibrium systems. This course will provide a foundation for design analysis of energy conversion systems and transport phenomena encountered in a variety of applications.

Rules & Requirements
Prerequisites: Mechanical Engineering 40
Credit Restrictions: Students will not receive credit for this course if they have taken ME 154.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Carey, Frenklach

MEC ENG 255 Advanced Combustion Processes 3 Units
Terms offered: Fall 2018, Fall 2016, Fall 2015
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.

Objectives Outcomes
Course Objectives: The course provides an introduction to the subject of combustion, covering a broad range of topics important to the fields of energy conversion, engines, pollution and fires. It consists of classroom lectures and laboratory demonstration. It treats the fundamental processes occurring in combustion systems and emphasizes on technological-problem solving skills. The laboratory demonstrations provide practical experience with real combustion systems. The course also uses computer programs to aid the students in the calculations and analysis, especially in thermodynamics and chemical kinetics.

Student Learning Outcomes: Upon completion of the course, students shall be able to:
Understand and calculate the stoichiometry, adiabatic flame temperature and heat of combustion of a fuel and oxidizer mixture. Understand the role of elementary and global reactions. Calculate reaction rates. Know how to use computer codes (e.g. Cantera) to solve combustion problems. Understand and calculate the ignition characteristics of a fuel and oxidizer mixture: flammability limits, self-ignition. Understand and calculate the structure and properties of a premixed flame: propagation speed, thickness, quenching distance, and minimum ignition energy. Understand and calculate the structure and properties of a diffusion flame: height, lift-off distance and blow-off limit. Understand the formation of pollutants from hydrocarbon combustion. Understand the operation of practical systems, specifically, furnaces and boilers, spark ignition and diesel internal combustion engines, and gas turbines.

Rules & Requirements
Prerequisites: ME 40, ME 106, and ME 109 (or their equivalents)
Credit Restrictions: Students will receive no credit for this course if they have taken ME 140.

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/Graduate
Grading: Letter grade.
Instructors: Chen, Fernandez-Pello

Advanced Combustion Processes: Read Less [-]
MEC ENG 256 Combustion 3 Units
Terms offered: Fall 2017, Spring 2015, Spring 2014
Combustion modeling. Multicomponent conservation equations with
reactions. Laminar and turbulent deflagrations. Rankine-Hugoniot
relations. Diffusion flames. Boundary layer combustion, ignition, and
stability.
Combustion: Read More [+]

Objectives Outcomes
Course Objectives: This course provides students a solid foundation
in combustion sciences and technologies relevant to current and future
energy conversion devices using combustion.

Student Learning Outcomes: Students will have the ability to perform
critical analyses of current and future reacting systems using analytical
and numerical methods. For practical combustion systems with complex
geometries, students will have gained sufficient background to further
their capabilities of using advanced numerical models.

Rules & Requirements
Prerequisites: ME 40, ME 106, and ME 109 (106 and 109 may be taken
concurrently) or their equivalents. ME 140/ME255 is recommended

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/Graduate
Grading: Letter grade.
Instructor: Chen

Combustion: Read Less [-]

MEC ENG 257 Advanced Combustion 3 Units
Terms offered: Fall 2016, Fall 2014, Fall 2012
Critical analyses of combustion phenomenon. Conservation relations
applied to reacting systems. Reactions are treated by both asymptotic
and numerical methods. Real hydrocarbon kinetics are used; where
available reduced kinetic mechanics are introduced. Flame propagation
theory and experiments are discussed in detail for both laminar and
turbulent flows.
Advanced Combustion: Read More [+]

Rules & Requirements
Prerequisites: 256

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Carey, Majumdar

Advanced Combustion: Read Less [-]

MEC ENG 258 Heat Transfer with Phase
Change 3 Units
Terms offered: Fall 2018, Spring 2016, Spring 2015
Heat transfer associated with phase change processes. Topics include
thermodynamics of phase change, evaporation, condensation, nucleation
and bubble growth, two phase flow, convective boiling and condensation,
melting and solidification.
Heat Transfer with Phase Change: Read More [+]

Rules & Requirements
Prerequisites: 151

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Carey

Heat Transfer with Phase Change: Read Less [-]

MEC ENG 259 Microscale Thermophysics
and Heat Transfer 3 Units
Terms offered: Fall 2017, Spring 2016, Spring 2014
This course introduces advanced statistical thermodynamics,
nonequilibrium thermodynamics, and kinetic theory concepts used to
analyze thermophysics of microscale systems and explores applications
in which microscale transport plays an important role.
Microscale Thermophysics and Heat Transfer: Read More [+]

Rules & Requirements
Prerequisites: 151, 254, or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Carey, Majumdar

Microscale Thermophysics and Heat Transfer: Read Less [-]
MEC ENG 260A Advanced Fluid Mechanics I 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
Introduces the foundations of fluid mechanics. Exact flow solutions are used to develop a physical insight of the fluid flow phenomena. Rigorous derivation of the equations of motion. Incompressible and compressible potential flows. Canonical viscous flows.
Advanced Fluid Mechanics I: Read More [+]
Rules & Requirements
Prerequisites: 106; 185 (strongly recommended) or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Advanced Fluid Mechanics I: Read Less [-]

MEC ENG 260B Advanced Fluid Mechanics II 3 Units
Terms offered: Spring 2019, Spring 2018, Spring 2017
Develops a working knowledge of fluid mechanics by identifying the essential physical mechanism in complex canonical flow problems which leads to simplified yet accurate formulation. Boundary layers, creeping flows, rotational flows, rotating flows. Stability and transition, introduction to turbulence.
Advanced Fluid Mechanics II: Read More [+]
Rules & Requirements
Prerequisites: 260A or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Advanced Fluid Mechanics II: Read Less [-]

MEC ENG 262 Hydrodynamic Stability and Instability 3 Units
Terms offered: Fall 2018, Fall 2014, Fall 2012
Discussions of linear and nonlinear instabilities in a variety of fluid flows: thermal convection, Rayleigh-Taylor flows, shearing flows, circular and cylindrical Couette flows (i.e., centrifugal instability). Use of the Landau equation, bifurcation diagrams, and energy methods for nonlinear flows.
Hydrodynamic Stability and Instability: Read More [+]
Rules & Requirements
Prerequisites: 185 and 106, or equivalents
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Marcus
Hydrodynamic Stability and Instability: Read Less [-]

MEC ENG 263 Turbulence 3 Units
Terms offered: Spring 2019, Spring 2017, Fall 2012
Turbulence: Read More [+]
Rules & Requirements
Prerequisites: 260A-260B or equivalent
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Savas
Turbulence: Read Less [-]
MEC ENG 266 Geophysical and Astrophysical Fluid Dynamics 3 Units
Terms offered: Spring 2019, Spring 2015, Spring 2013
This course examines high-Reynolds number flows, including their stability, their waves, and the influence of rotating and stratification as applied to geophysical and astrophysical fluid dynamics as well as to engineering flows. Examples of problems studied include vortex dynamics in planetary atmospheres and protoplanetary disks, jet streams, and waves (Rossby, Poincare, inertial, internal gravity, and Kelvin) in the ocean and atmosphere.

Geophysical and Astrophysical Fluid Dynamics: Read More [+]

Rules & Requirements
Prerequisites: Graduate-level standing or consent of instructor
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Marcus
Formerly known as: 260C
Geophysical and Astrophysical Fluid Dynamics: Read Less [-]

MEC ENG C268 Physicochemical Hydrodynamics 3 Units
Terms offered: Spring 2017, Fall 2013, Fall 2011, Spring 2011

Physicochemical Hydrodynamics: Read More [+]

Rules & Requirements
Prerequisites: A first graduate course in fluid mechanics such as 260A-260B
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Morris
Also listed as: CHM ENG C268
Physicochemical Hydrodynamics: Read Less [-]

MEC ENG 273 Oscillations in Linear Systems 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016
Response of discrete and continuous dynamical systems, damped and undamped, to harmonic and general time-dependent loading. Convolution integrals and Fourier and Laplace transform methods. Lagrange’s equations; eigensolutions; orthogonality; generalized coordinates; nonreciprocal and degenerate systems; Rayleigh’s quotient.

Oscillations in Linear Systems: Read More [+]

Objectives Outcomes
Course Objectives: To give a compact, consistent, and reasonably connected account of the theory of linear vibration at the advanced level. A secondary purpose is to survey some topics of contemporary research. Applications will be mentioned whenever feasible.

Student Learning Outcomes: Acquired necessary knowledge and scientific maturity to begin research in dynamics and vibration.

Rules & Requirements
Prerequisites: ME 104 and ME 133 or their equivalents
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/Graduate
Grading: Letter grade.
Instructor: Ma
Oscillations in Linear Systems: Read Less [-]

MEC ENG 274 Random Oscillations of Mechanical Systems 3 Units
Terms offered: Spring 2018, Spring 2015, Spring 2011

Random Oscillations of Mechanical Systems: Read More [+]

Rules & Requirements
Prerequisites: 104 and 133
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Ma
Random Oscillations of Mechanical Systems: Read Less [-]
MEC ENG 275 Advanced Dynamics 3 Units
Terms offered: Spring 2017, Spring 2015, Spring 2012
Review of Lagrangian dynamics. Legendre transform and Hamilton's equations, Cyclic coordinates, Canonical transformations, Hamilton-Jacobi theory, integrability. Dynamics of asymmetric systems. Approximation theory. Current topics in analytical dynamics. Advanced Dynamics: Read More [+]
Rules & Requirements
Prerequisites: 175
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Advanced Dynamics: Read Less [-]

MEC ENG 277 Nonlinear and Random Vibrations 3 Units
Terms offered: Spring 2016, Spring 2014, Spring 2012
Objectives Outcomes
Course Objectives: To give a compact, consistent, and reasonably connected account of the theory of nonlinear vibrations and uncertainty analysis at the advanced level. A secondary purpose is to survey some topics of contemporary research.
Student Learning Outcomes: Acquired necessary knowledge and scientific maturity to begin research in nonlinear vibrations and uncertainty analysis.
Rules & Requirements
Prerequisites: Mechanical Engineering 104 and Mechanical Engineering 133 or their equivalent
Credit Restrictions: Students will not receive credit if they have taken Mechanical Engineering 274.
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/Graduate
Grading: Letter grade.
Instructor: O’Connell
Nonlinear and Random Vibrations: Read Less [-]

MEC ENG C278 Adv Designing for the Human Body 4 Units
Terms offered: 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., prosthetics 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.
Adv 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 that 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”;
• Three separate written projects evaluating devices that interact with the body. Projects will focus on 1) biomechanical analysis, 2) FDA regulations and procedures, and 3) design lifecycle.
Student Learning Outcomes: 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: 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.<BR/>
Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: O’Connell
Also listed as: BIO ENG C237
Adv Designing for the Human Body: Read Less [-]
MEC ENG C279 Introduction to Statistical Mechanics for Engineers 3 Units
Terms offered: Spring 2017, Fall 2013, Fall 2012

Introduction to Statistical Mechanics for Engineers: Read More [+]

Objectives Outcomes
Course Objectives: To provide a modern introduction to the application of statistical mechanics for engineering with a particular emphasis on mechanical response.

Rules & Requirements
Prerequisites: CE C231 or MSE C211 or ME 185 or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Govindjee, Papadopoulos

MEC ENG 280A Introduction to the Finite Element Method 3 Units
Terms offered: Fall 2018, Fall 2017, Fall 2016

Introduction to the Finite Element Method: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 50A-50B; some familiarity with elementary field theories of solid/fluid mechanics and/or thermal science

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/Graduate
Grading: Letter grade.
Instructors: Papadopoulos, Zohdi

Formerly known as: 280

MEC ENG 280B Finite Element Methods in Nonlinear Continua 3 Units
Terms offered: Spring 2019, Spring 2016, Spring 2013

Finite Element Methods in Nonlinear Continua: Read More [+]

Rules & Requirements
Prerequisites: 280A or equivalent; background in continuum mechanics at the level of 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Papadopoulos

MEC ENG 281 Methods of Tensor Calculus and Differential Geometry 3 Units
Terms offered: Fall 2017, Fall 2015, Spring 2012
Methods of tensor calculus and classical differential geometry. The tensor concept and the calculus of tensors, the Riemann-Christoffel tensor and its properties, Riemannian and Euclidean spaces. Geometry of a surface, formulas of Weingarten, and equations of Gauss and Codazzi.

Methods of Tensor Calculus and Differential Geometry: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 53 and 54

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.

Methods of Tensor Calculus and Differential Geometry: Read Less [-]
MEC ENG 282 Theory of Elasticity 3 Units
Terms offered: Spring 2018, Spring 2016, Fall 2014
Fundamentals and general theorems of the linear theory of elasticity (in three dimensions) and the formulation of static and dynamic boundary value problems. Application to torsion, flexure, and two-dimensional problems of plane strain, generalized plane stress, and bending of plates. Representation of basic field equations in terms of displacement potentials and stress functions. Some basic three-dimensional solutions. Theory of Elasticity: Read More [+]

Rules & Requirements
Prerequisites: 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Bogy, Steigmann

Theory of Elasticity: Read Less [-]

MEC ENG 283 Wave Propagation in Elastic Media 3 Units
Terms offered: Fall 2013, Fall 2012, Fall 2009
Propagation of mechanical disturbances in unbounded and bounded media. Surface waves, wave reflection and transmission at interfaces and boundaries. Stress waves due to periodic and transient sources. Some additional topics may vary with instructor.

Wave Propagation in Elastic Media: Read More [+]

Rules & Requirements
Prerequisites: 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Casey

Wave Propagation in Elastic Media: Read Less [-]

MEC ENG 284 Nonlinear Theory of Elasticity 3 Units
Terms offered: Spring 2019, Spring 2017, Spring 2014

Nonlinear Theory of Elasticity: Read More [+]

Objectives Outcomes

Course Objectives: To provide students with a working knowledge of elasticity.

Student Learning Outcomes: Ability to embark on modern research in the field.

Rules & Requirements
Prerequisites: ME 185 or equivalent

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/Graduate
Grading: Letter grade.
Instructor: Casey

Nonlinear Theory of Elasticity: Read Less [-]

MEC ENG 285A Foundations of the Theory of Continuous Media 3 Units
Terms offered: Spring 2018, Spring 2016, Spring 2015
A general development of thermodynamics of deformable media, entropy production, and related entropy inequalities. Thermomechanical response of dissipative media, including those for viscous fluids and nonlinear elastic solids. A discussion of invariance, internal constraints, material symmetry, and other special topics.

Foundations of the Theory of Continuous Media: Read More [+]

Rules & Requirements
Prerequisites: 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Casey

Formerly known as: 285

Foundations of the Theory of Continuous Media: Read Less [-]
MEC ENG 285B Surfaces of Discontinuity and Inhomogeneities in Deformable Continua 3 Units
Terms offered: Fall 2011, Spring 2010, Fall 2008
Surfaces of Discontinuity and Inhomogeneities in Deformable Continua: Read More [+]

Rules & Requirements
Prerequisites: 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Casey

Surfaces of Discontinuity and Inhomogeneities in Deformable Continua: Read Less [-]

MEC ENG 285C Electrodynamics of Continuous Media 3 Units
Terms offered: Spring 2019, Spring 2015, Spring 2013
This course presents the fundamentals of electromagnetic interactions in deformable continuous media. It develops the background necessary to understand various modern technologies involving MEMS devices, sensors and actuators, plasmas, and a wide range of additional phenomena. The emphasis of this course is on fundamentals, beginning with Maxwell’s equations in vacuum, the ether relations and their extension to electromagnetic interactions in materials. The treatment is general within the limits of nonrelativistic physics and accommodates coupling with mechanical and thermal effects. The topics discussed are all developed at a general level including the effects of finite deformations. Various linear models, which are especially useful in applications, are developed through specialization of general theory. This course will be of interest to students in engineering, physics, and applied mathematics.

Electrodynamics of Continuous Media: Read More [+]

Rules & Requirements
Prerequisites: A first course in continuum mechanics (such as 185 or Civil Engineering 231.)

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Steigmann
Formerly known as: 284B

Electrodynamics of Continuous Media: Read Less [-]
MEC ENG 285D Engineering Rheology 3 Units
Terms offered: Spring 2016, Spring 2014
Rheology is the study of the interaction between forces and the flow/deformation of materials. It deals with aspects of the mechanics of materials that are not covered in the standard curriculum, such as the response of viscoelastic fluids and solids, together with methods for modeling and simulating their response. Such materials exhibit a host of counterintuitive phenomena that call for nonlinear modeling and a close interaction between theory and experiment. This is a special-topics course for graduate students seeking advanced knowledge of these phenomena and associated modeling.

Objectives Outcomes
Course Objectives: To expose students to the theory and methods of modern rheology, including: the mechanics of flow in complex non-Newtonian fluids and the mechanics of viscoelastic solids.
Student Learning Outcomes: Skill in modeling and simulating rheological problems.

Rules & Requirements
Prerequisites: A basic background in continuum mechanics (as covered in ME 185)
Repeat rules: Course may be repeated for credit when topic changes.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Steigmann

MEC ENG C285E Mechanics and Physics of Lipid Bilayers 3 Units
Terms offered: Fall 2017
Lipid bilayers constitute the membrane that encloses every animal cell and many of its interior structures, including the nuclear envelope, the organelles and the endoplasmic reticulum. This is a unique course devoted to modern developments in this exceptionally active field of research, ranging from models based on continuum theory to recent developments based on statistical mechanics.

Objectives Outcomes
Student Learning Outcomes: To expose students to advanced current work on the mechanics and physics of lipid bilayers (a very active field of current research relevant to biomechanics and biophysics)

Rules & Requirements
Prerequisites: Mechanical Engineering 185 or equivalent

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Steigmann
Also listed as: CHM ENG C294A

MEC ENG 286 Theory of Plasticity 3 Units
Terms offered: Fall 2018, Spring 2015, Spring 2013
Formulation of the theory of plasticity relative to loading surfaces in both strain space and stress space and associated loading criteria. Nonlinear constitutive equations for finitely deformed elastic-plastic materials. Discussion of strain-hardening and special cases. Applications.

Objectives Outcomes
Theory of Plasticity: Read More [+]

Rules & Requirements
Prerequisites: 185

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Casey, Papadopoulos

Theory of Plasticity: Read Less [-]
**MEC ENG 287 Graduate Introduction to Continuum Mechanics 3 Units**

Terms offered: Fall 2018, Spring 2008, Spring 2004

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 subfields, including Fluid Mechanics, Solid Mechanics and Heat Transfer.

Graduate Introduction to Continuum Mechanics: Read More [+]

**Objectives Outcomes**

**Course Objectives:** This is a gateway course for graduate students entering the fields of Solid Mechanics and Fluid Mechanics. It is designed for students who require a rigorous foundation-level understanding in support of their future work in the theory, modeling and analysis of problems arising in the Engineering Sciences.

**Student Learning Outcomes:** 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 graduate work in allied fields.

**Rules & Requirements**

**Prerequisites:** Physics 7A, Math 53 and Math 54, as well as some prior exposure to the elementary mechanics of solids and fluids

**Credit Restrictions:** Students will receive no credit after taking ME 185.

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

**Additional Details**

**Subject/Course Level:** Mechanical Engineering/Graduate

**Grading:** Letter grade.

**Instructors:** Casey, Johnson, Papadopoulos, Steigmann

Graduate Introduction to Continuum Mechanics: Read Less [-]

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**MEC ENG 288 Theory of Elastic Stability 3 Units**

Terms offered: Spring 2009, Fall 2007, Fall 1999


Theory of Elastic Stability: Read More [+]

**Rules & Requirements**

**Prerequisites:** 185 and 273

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

**Additional Details**

**Subject/Course Level:** Mechanical Engineering/Graduate

**Grading:** Letter grade.

**Instructor:** Steigmann

Theory of Elastic Stability: Read Less [-]

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**MEC ENG 289 Theory of Shells 3 Units**

Terms offered: Spring 2017, Spring 2012, Fall 2007

A direct formulation of a general theory of shells and plates based on the concept of Cosserat (or Directed) surfaces. Nonlinear constitutive equations for finitely deformed elastic shells. Linear theory and a special nonlinear theory with small strain accompanied by large or moderately large rotation. Applications.

Theory of Shells: Read More [+]

**Rules & Requirements**

**Prerequisites:** 185 and 281

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

**Additional Details**

**Subject/Course Level:** Mechanical Engineering/Graduate

**Grading:** Letter grade.

**Instructors:** Johnson, Steigmann

Theory of Shells: Read Less [-]
MEC ENG 290C Topics in Fluid Mechanics 3 Units
Terms offered: Spring 2015, Fall 2010, Fall 2003
Lectures on special topics which will be announced at the beginning of each semester that the course is offered. Topics may include transport and mixing, geophysical fluid dynamics, biofluid dynamics, oceanography, free surface flows, non-Newtonian fluid mechanics, among other possibilities. 
Topics in Fluid Mechanics: Read More [+] 

Rules & Requirements
Prerequisites: Consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Savas, Yeung

Topics in Fluid Mechanics: Read Less [-]

MEC ENG 290D Solid Modeling and CAD/CAM Fundamentals 3 Units
Terms offered: Fall 2018, Fall 2016, Fall 2014
Graduate survey of solid modeling research. Representations and algorithms for 3D solid geometry. Applications in design, analysis, planning, and manufacturing of mechanical parts, including CAD/CAM, reverse engineering, robotics, mold-making, and rapid prototyping.
Solid Modeling and CAD/CAM Fundamentals: Read More [+] 

Objectives Outcomes
Course Objectives: Students will gain experience with critical close reading of primary sources, evaluating and synthesizing the content of research papers. They will design, implement, and analyze a sample of geometric algorithms for applications in Solid Modeling and CAD/CAM.

Student Learning Outcomes: Students will be familiar with seminal research and important solid modeling representations and fundamental geometric algorithms, giving them insight into the capabilities and limitations of commercial solid modeling systems. They will have gained programming experience and skills and an understanding of theoretical and practical concerns as they design, implement, and analyze a sample of geometric algorithms for applications in Solid Modeling and CAD/CAM.

Rules & Requirements
Prerequisites: An introductory programming course; graduate standing or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: McMains

Solid Modeling and CAD/CAM Fundamentals: Read Less [-]
MEC ENG 290G Laser Processing and Diagnostics 3 Units
Terms offered: Spring 2018, Fall 2015, Spring 2013
The course provides a detailed account of laser interactions with materials in the context of advanced materials processing and diagnostics.

Rules & Requirements
Prerequisites: Graduate standing or undergraduate elective upon completion of ME109
Repeat rules: Course may be repeated for credit when topic changes.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Grigoropoulos

Laser Processing and Diagnostics: Read Less [-]

MEC ENG 290H Green Product Development: Design for Sustainability 3 Units
Terms offered: Spring 2019, Spring 2017, Spring 2013
The focus of the course is management of innovation processes for sustainable products, from product definition to sustainable manufacturing and financial models. Using a project in which students will be asked to design and develop a product or service focused on sustainability, we will teach processes for collecting customer and user needs data, prioritizing that data, developing a product specification, sketching and building product prototypes, and interacting with the customer/community during product development. The course is intended as a very hands-on experience in the "green" product development process. The course will be a Management of Technology course offered jointly with the College of Engineering and the Haas School of Business. In addition, it will also receive credit towards the new Certificate on Engineering Sustainability and Environmental Management program. We aim to have half MBA students and half Engineering students (with a few other students, such as from the School of Information) in the class. The instructors will facilitate students to form mixed disciplinary reams for the development of their "green" products.

Rules & Requirements
Prerequisites: Graduate standing in Engineering or Information, or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Agogino, Beckmann

Green Product Development: Design for Sustainability: Read Less [-]
MEC ENG 290I Sustainable Manufacturing 3 Units
Terms offered: Spring 2016, Spring 2015, Spring 2014
Sustainable design, manufacturing, and management as exercised by the enterprise is a poorly understood idea and one that is not intuitively connected to business value or engineering practice. This is especially true for the manufacturing aspects of most enterprises (tools, processes, and systems). This course will provide the basis for understanding (1) what comprises sustainable practices in for-profit enterprises, (2) how to practice and measure continuous improvement using sustainability thinking, techniques, and tools for product and manufacturing process design, and (3) the techniques for and value of effective communication of sustainability performance to internal and external audiences. Material in the course will be supplemented by speakers with diverse backgrounds in corporate sustainability, environmental consulting, non-governmental organizations, and academia.
Prerequisites: Graduate standing, or consent of instructor, especially for students not in engineering, business, or other management of technology programs
Repeat rules: Course may be repeated for credit without restriction.
Rules & Requirements
Prerequisites: Graduate standing, or consent of instructor, especially for students not in engineering, business, or other management of technology programs
Repeat rules: Course may be repeated for credit without restriction.
Rules & Requirements
Prerequisites: ME C232 and ME C231A
Grading: Letter grade.
Instructor: Borrelli

MEC ENG 290J Predictive Control for Linear and Hybrid Systems 3 Units
Terms offered: Spring 2016, Fall 2014, Spring 2013
Advanced optimization, polyhedra manipulation, and multiparametric programming. Invariant set theory. Analysis and design of constrained predictive controllers for linear and nonlinear systems. Computational oriented models of hybrid systems. Analysis and design of constrained predictive controllers for hybrid systems.
Prerequisites: ME C232 and ME C231A
Grading: Letter grade.
Instructor: Borrelli
Objectives Outcomes
Course Objectives: The course is designed for graduate students who want to expand their knowledge on optimization-based control design. 50% will be focusing on advanced theory. 50% on applications.
Student Learning Outcomes: At the end of the course, the students will write a theoretical paper on MPC and will design an experiment where the theory is implemented.
Subjects/Courses Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Borrelli

Sustainable Manufacturing: Read More [+] Predictive Control for Linear and Hybrid Systems: Read Less [-]
MEC ENG 290KA Innovation through Design Thinking 2 Units
Terms offered: Fall 2017, Fall 2016, Fall 2015
Designed for professionally-oriented graduate students, this course explores key concepts in design innovation based on the human-centered design approach called “design thinking.” Topics covered include human-centered design research, analysis of research to develop design principles, creativity techniques, user needs framing and strategic business modeling.

Objectives Outcomes
Student Learning Outcomes: The primary goal is to provide students with a set of innovation skills that will allow them to flourish in a climate of complex problem solving and design challenges. Students will develop expertise in innovation skills drawn from the fields of critical thinking, design thinking and systems thinking. Students should be able to apply the skills mastered to real world design problems.

Rules & Requirements
Prerequisites: Graduate level standing; Prior design course

MEC ENG 290KB Life Cycle Thinking in Engineering Design 1 Unit
Terms offered: Fall 2017, Fall 2016, Fall 2015
How do we design and manufacture greener products, and how do we know if they really are? This class both provides tools for sustainable design innovation and metrics to measure success. Students will use both creative and analytical skills, generating new ideas as well as evaluating designs with screening-level life cycle assessment.

Objectives Outcomes
Course Objectives: The objective of this course is to provide students with the tools to frame, analyze, and redesign their projects in terms of life cycle environmental impacts, to improve the sustainability of their projects.

Student Learning Outcomes: Students can expect to depart the course understanding the practice of basic life cycle assessment, including how to set boundaries, choose functional units, and use LCA software. Students will also learn how to integrate this practice into new product development in the context of the “triple bottom line” – economy, environment and society. Students should be able to apply the skills mastered to real world design and engineering problems.

Rules & Requirements
Prerequisites: Graduate level standing; Prior design course

Innovation through Design Thinking: Read More [+]
Innovation through Design Thinking: Read Less [-]
MEC ENG 290L Introduction to Nano-Biology 3 Units
Terms offered: Fall 2018, Spring 2017, Spring 2016
This course introduces graduate students in Mechanical Engineering to the nascent field of Nano-Biology. The course is comprised of both formal lectures and projects. Lectures will include an introduction to both molecular biology (components of cells, protein structure and function, DNA, gene regulation, etc.) and nanotechnology (“bottom up” and “top down” nanotechnologies), an overview of current instrumentation in biology, an in-depth description of the recent integration of molecular biology with nanotechnology (for sensing or labeling purposes, elucidating information on cells, etc.), and an introduction to Systems Biology (design principles of biological circuits). Introduction to Nano-Biology: Read More [+]

Objectives Outcomes
Course Objectives: The course introduces engineering students to the interplay between Nanotechnology and Biology and serves to 1) broaden the areas of research that students might not have necessarily considered, 2) expose students to cutting-edge research, and 3) develop analytical skills.

Student Learning Outcomes: Students should be able to critique methods and techniques that researchers have used to study and probe biological systems at the nano-scale. They will learn how to write research proposals and how to give an effective presentation. Through the research proposals, students will learn about the scientific-research process: formulating the problem, determining the appropriate experimental methods, interpreting the results, and arriving at a conclusion. Through presentations, students will gain valuable experience in public speaking and learn the process by which they would have to propose a research problem, be it in academia or industry.

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/Graduate
Grading: Letter grade.
Instructor: Sohn
Introduction to Nano-Biology: Read Less [-]

MEC ENG 290M Expert Systems in Mechanical Engineering 3 Units
Terms offered: Fall 2005, Fall 2003, Spring 1999
Introduction to artificial intelligence and decision analysis in mechanical engineering. Fundamentals of analytic design, probability theory, failure analysis, risk assessment, and Bayesian and logical inference. Applications to expert systems in probabilistic mechanical engineering design and failure diagnostics. Use of automated influence diagrams to codify expert knowledge and to evaluate optimal design decisions. Expert Systems in Mechanical Engineering: Read More [+]

Rules & Requirements
Prerequisites: 102A and 102B or equivalent

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Agogino
Expert Systems in Mechanical Engineering: Read Less [-]

MEC ENG 290N System Identification 3 Units
Terms offered: Fall 2010, Fall 2008, Spring 2007
This course is intended to provide a comprehensive treatment of both classical system identification and recent work in control-oriented system identification. Numerical, practical, and theoretical aspects will be covered. Topics treated include time and frequency domain methods, generalized parameter estimation, identification of structured non-linear systems, modeling uncertainty bounding, and state-space methods. System Identification: Read More [+]

Rules & Requirements
Prerequisites: 232, Electrical Engineering and Computer Sciences 221A or consent of instructor

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Poolla
System Identification: Read Less [-]
MEC ENG 290P New Product Development: Design Theory and Methods 3 Units
Terms offered: Fall 2015, Fall 2013, Fall 2012
This course is aimed at developing the interdisciplinary skills required for successful product development in today's competitive marketplace. We expect students to be disciplinary experts in their own field (e.g., engineering, business). By bringing together multiple perspectives, we will learn how product development teams can focus their efforts to quickly create cost-effective products that exceed customers' expectations.

MEC ENG 290Q Dynamic Control of Robotic Manipulators 3 Units
Terms offered: Fall 2008, Spring 2007, Fall 2001

MEC ENG 290R Topics in Manufacturing 3 Units
Terms offered: Fall 2017, Spring 2016, Fall 2014
Advanced topics in manufacturing research. Topics vary from year to year.

Rules & Requirements

Prerequisites: Graduate standing, consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate

Grading: Letter grade.

Instructors: Dornfeld, McMains, Wright
MEC ENG 290T Plasmonic Materials 3 Units
Terms offered: Fall 2017, Fall 2014, Spring 2013
This course deals with fundamental aspects of plasmonic materials. The electromagnetic responses of those artificially constructed materials will be discussed. Physics of surface plasmons and dispersion engineering will be introduced. Resonant phenomena associated with the negative permittivity and permeability and the left-handed propagation will be presented. Methods of design, fabrication, and characterization of plasmonic materials will be discussed.

Rules & Requirements
Prerequisites: Physics 110A or consent of instructor
Repeat rules: Course may be repeated for credit when topic changes.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Zhang

MEC ENG 290U Interactive Device Design 4 Units
Terms offered: Fall 2017, Fall 2016, Fall 2015
This course teaches concepts and skills required to design, prototype, and fabricate interactive devices -- that is, physical objects that intelligently respond to user input and enable new types of interactions.

Objectives Outcomes
Course Objectives: To educate students in the hybrid design skills needed for today’s electronic products. These combine mechanical devices, electronics, software, sensors, wireless communication and connections to the cloud. Students also learn scale up procedures for volume manufacturing.

Student Learning Outcomes: 3D printed prototypes, learned software, programming and design skills

Rules & Requirements
Prerequisites: Instructor consent

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Hartmann, Wright

Topics in Energy, Climate, and Sustainability 1 Unit
Terms offered: Prior to 2007
Weekly lecture series featuring guest speakers from academia, industry, government, and civil society. Speakers will address cutting-edge topics involving novel technologies in energy and climate; the production, consumption, and economic exchange of energy resources and commodities; and energy and climate policy. Undergraduate and graduate students welcome.

Objectives Outcomes
Course Objectives: Introduce UC Berkeley students to a variety of perspectives from stakeholders working on the science, technology, economics, and policy of energy and climate issues.

Student Learning Outcomes: Introduce students to interdisciplinary perspectives on energy and climate issues; attract top speakers to campus from academia, industry, government, and civil society; and build community at UC Berkeley around interdisciplinary energy and climate issues.

Instructors: Hartmann, Wright, Burns, Cullenward

Topics in Energy, Climate, and Sustainability: Read Less [-]
MEC ENG C290S Hybrid Systems and Intelligent Control 3 Units
Terms offered: Spring 2018, Spring 2016, Spring 2014
Hybrid Systems and Intelligent Control: Read More [+]

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Formerly known as: 291E
Also listed as: EL ENG C291E
Hybrid Systems and Intelligent Control: Read Less [-]

MEC ENG C290X Advanced Technical Communication: Proposals, Patents, and Presentations 3 Units
This course will help the advanced Ph.D. student further develop critically important technical communication traits via a series of lectures, interactive workshops, and student projects that will address the structure and creation of effective research papers, technical reports, patents, proposals, business plans, and oral presentations. One key concept will be the emphasis on focus and clarity--achieved through critical thinking regarding objectives and context. Examples will be drawn primarily from health care and bioengineering multidisciplinary applications.
Advanced Technical Communication: Proposals, Patents, and Presentations: Read More [+]

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

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Formerly known as: 291E
Also listed as: EL ENG C291E
Advanced Technical Communication: Proposals, Patents, and Presentations: Read Less [-]

MEC ENG 292A Advanced Special Topics in Bioengineering 1 - 4 Units
Terms offered: Spring 2018, Fall 2017, Spring 2017
This 292 series covers current topics of research interest in bioengineering and biomechanics. The course content may vary semester to semester. Check with the department for current term topics.
Advanced Special Topics in Bioengineering: Read More [+]

Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Instructor: Faculty
Advanced Special Topics in Bioengineering: Read Less [-]

MEC ENG 292B Advanced Special Topics in Controls 1 - 4 Units
Terms offered: Fall 2018, Spring 2018, Fall 2017
This 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.
Advanced Special Topics in Controls: Read More [+]

Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.

Rules & Requirements
Prerequisites: Graduate standing or consent of instructor
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/Graduate
Grading: Letter grade.
Advanced Special Topics in Controls: Read Less [-]
MEC ENG 292C Advanced Special Topics in Design 1 - 4 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
This 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.
Advanced Special Topics in Design: Read More [+]

Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.

Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Grading: Letter grade.

Advanced Special Topics in Design: Read Less [-]

MEC ENG 292D Advanced Special Topics in Dynamics 1 - 4 Units
Terms offered: Prior to 2007
This 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.
Advanced Special Topics in Dynamics: Read More [+]

Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.

Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Grading: Letter grade.

Advanced Special Topics in Dynamics: Read Less [-]
MEC ENG 292E Advanced Special Topics in Energy Science and Technology 1 - 4 Units

Terms offered: Spring 2019, Spring 2018, Fall 2017

This 292 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.

Advanced Special Topics in Energy Science and Technology: Read More [+]

Objectives Outcomes

Course Objectives: Varies with course.

Student Learning Outcomes: Varies with course.

Rules & Requirements

Prerequisites: Graduate student standing or consent of instructor

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/Graduate

Grading: Letter grade.

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

MEC ENG 292F Advanced Special Topics in Fluids 1 - 4 Units

Terms offered: Prior to 2007

This 292 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.

Advanced Special Topics in Fluids: Read More [+]

Objectives Outcomes

Course Objectives: Varies with course.

Student Learning Outcomes: Varies with course.

Rules & Requirements

Prerequisites: Graduate student standing or consent of instructor

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/Graduate

Grading: Letter grade.

Advanced Special Topics in Fluids: Read Less [-]
MEC ENG 292G Advanced Special Topics in Manufacturing 1 - 4 Units
Terms offered: Prior to 2007
This 292 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.
Advanced Special Topics in Manufacturing: Read More [+]

Objectives Outcomes

Course Objectives: Varies with course.

Student Learning Outcomes: Varies with course.

Rules & Requirements

Prerequisites: Graduate student standing or consent of instructor

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/Graduate

Grading: Letter grade.

Advanced Special Topics in Manufacturing: Read Less [-]

MEC ENG 292H Advanced Special Topics in Materials 1 - 4 Units
Terms offered: Prior to 2007
This 292 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.
Advanced Special Topics in Materials: Read More [+]

Objectives Outcomes

Course Objectives: Varies with course.

Student Learning Outcomes: Varies with course.

Rules & Requirements

Prerequisites: Graduate student standing or consent of instructor

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/Graduate

Grading: Letter grade.

Advanced Special Topics in Materials: Read Less [-]
MEC ENG 292I Advanced Special Topics in Mechanics 1 - 4 Units
Terms offered: Prior to 2007
This 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.
Advanced Special Topics in Mechanics: Read More [+]
Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.
Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Grading: Letter grade.
Advanced Special Topics in Mechanics: Read Less [-]

MEC ENG 292J Advanced Special Topics in MEMS/Nano 1 - 4 Units
Terms offered: Spring 2018
This 292 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.
Advanced Special Topics in MEMS/Nano: Read More [+]
Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.
Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Grading: Letter grade.
Advanced Special Topics in MEMS/Nano: Read Less [-]
MEC ENG 292K Advanced Special Topics in Ocean Engineering 1 - 4 Units
Terms offered: Spring 2019
This 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.
Advanced Special Topics in Ocean Engineering: Read More [+]

Objectives Outcomes
Course Objectives: Varies with course.
Student Learning Outcomes: Varies with course.

Rules & Requirements
Prerequisites: Graduate student standing or consent of instructor
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/Graduate
Grading: Letter grade.
Advanced Special Topics in Ocean Engineering: Read Less [-]

MEC ENG 297 Engineering Field Studies 1 - 12 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
Supervised experience relative to specific aspects of practice in engineering. Under guidance of a faculty member, the student will work in an internship in industry. Emphasis is to attain practical experience in the field.
Engineering Field Studies: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 1-12 hours of independent study per week

Summer:
6 weeks - 2.5-20 hours of independent study per week
10 weeks - 1.5-18 hours of independent study per week

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Advanced Special Topics in Ocean Engineering: Read Less [-]

MEC ENG 298 Group Studies, Seminars, or Group Research 1 - 8 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
Advanced studies in various subjects through special seminars on topics to be selected each year. Informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation.
Group Studies, Seminars, or Group Research: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-8 hours of independent study per week
Summer: 10 weeks - 1.5-12 hours of independent study per week

Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Group Studies, Seminars, or Group Research: Read Less [-]

MEC ENG 299 Individual Study or Research 1 - 12 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
Investigations of advanced problems in mechanical engineering.
Individual Study or Research: Read More [+]

Rules & Requirements
Prerequisites: Graduate standing in engineering, physics, or mathematics
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-12 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/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Individual Study or Research: Read Less [-]
MEC ENG 375 Teaching of Mechanical Engineering at the University Level 1 - 6 Units
Terms offered: Spring 2019, Fall 2018, Spring 2018
Weekly seminars and discussions on effective teaching methods. Educational objectives. Theories of learning. The lecture and alternative approaches. Use of media resources. Student evaluation. Laboratory instruction. Curricula in mechanical engineering. Practice teaching. This course is open to Teaching Assistants of Mechanical Engineering. Teaching of Mechanical Engineering at the University Level: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 1 hour of seminar per week
Additional Details
Subject/Course Level: Mechanical Engineering/Professional course for teachers or prospective teachers
Grading: Offered for satisfactory/unsatisfactory grade only.
Formerly known as: Mechanical Engineering 301
Teaching of Mechanical Engineering at the University Level: Read Less [-]

UGBA 10 Principles of Business 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
This course provides an introduction to the study of the modern business enterprise. The course is taught in five modules, the order of which may vary from semester to semester. The first examines the role and governance of business enterprise in a market economy. The second concentrates on financial issues, while the third looks at the problems of managing people in organizations. The fourth examines product pricing, marketing, and distribution issues and the last concentrates on the international business environment.
Principles of Business: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Formerly known as: Business Administration 10
Principles of Business: Read Less [-]

UGBA 24 Freshman Seminars 1 Unit
Offered through: Business Administration
Terms offered: Fall 2013, Spring 2007, Spring 2005
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: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Also listed as: L & S C5
Freshman Seminars: Read Less [-]
UGBA 39AC Philanthropy: A Cross-Cultural Perspective 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Fall 2016
This class will compare and contrast the variety of gift giving and sharing traditions that make up American philanthropy. Both the cultural antecedents and their expression in this country will be explored from five ethnic and racial groups: Native American, European American, African American, Hispanic American, and Asian American. The goal is to gain a greater understanding of the many dimensions of philanthropy as it is practiced in the United States today.

Philanthropy: A Cross-Cultural Perspective: Read More [+]

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Formerly known as: Business Administration 39AC

Philanthropy: A Cross-Cultural Perspective: Read Less [-]

UGBA 39D Freshman/Sophomore Seminar 2 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2008, Fall 2007
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.

Freshman/Sophomore Seminar: Read More [+]

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

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

Hours & Format
Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Formerly known as: Business Administration 39

Freshman/Sophomore Seminar: Read Less [-]

UGBA 39E Freshman/Sophomore Seminar 2 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2018, Fall 2016, Fall 2015
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.

Freshman/Sophomore Seminar: Read More [+]

Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

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

Hours & Format
Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

Formerly known as: Business Administration 39

Freshman/Sophomore Seminar: Read Less [-]
UGBA C95B Introduction to the Biotechnology Field and Industry: Impact, History, Therapeutics R&D, Entrepreneurship and Careers 2 Units
Offered through: Business Administration
Terms offered: Spring 2019
This course offers an introduction to the field of biotechnology and will cover the history of the field, its impact on medicine and society, key methodologies, important therapeutic areas, and the range of career options available in the biopharmaceutical industry. In addition to lectures on innovation and entrepreneurship, students will hear from lecturers with expertise ranging from molecular biology to clinical trial design and interpretation. Several case studies of historically impactful scientists, entrepreneurs, and biotherapeutic companies will be presented. Students will work in teams to create and develop novel biotechnology company ideas to present in class. Intended for students interested in the Biology +Business program.

Introduction to the Biotechnology Field and Industry: Impact, History, Therapeutics R&D, Entrepreneurship and Careers: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.
Instructors: Kirn, Lasky
Also listed as: MCELLBI C95B

Introduction to the Biotechnology Field and Industry: Impact, History, Therapeutics R&D, Entrepreneurship and Careers: Read Less [-]

UGBA 96 Lower Division Special Topics in Business Administration 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Study in various fields of business administration for lower division students. Topics will vary from year to year and will be announced at the beginning of each semester.

Lower Division Special Topics in Business Administration: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 5 hours of lecture per week
8 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 98
Directed Group Study: Read Less [-]

UGBA 100 Business Communication 2 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Theory and practice of effective communication in a business environment. Students practice what they learn with oral presentations and written assignments that model real-life business situations.

Business Communication: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week
Summer: 6 weeks - 5 hours of lecture per week
8 weeks - 4 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Business Communication: Read Less [-]
UGBA 101A Microeconomic Analysis for Business Decisions 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
Economic analysis applicable to the problems of business enterprises with emphasis on the determination of the level of prices, outputs, and inputs; effects of the state of the competitive environment on business and government policies.
Microeconomic Analysis for Business Decisions: Read More [+]
Rules & Requirements
Prerequisites: Economics 1, Mathematics 1A or 16A, Statistics 21, or equivalents
Credit Restrictions: Students will receive no credit for UGBA 101A after completing ECON 100A or ECON 101A, ENVECON 100 or IAS 106. A deficient grade in ECON 100A, ECON 101A, ENVECON 100, or IAS 106 may be repeated by taking UGBA 101A.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Microeconomic Analysis for Business Decisions: Read Less [-]

UGBA 101B Macroeconomic Analysis for Business Decisions 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2019 Second 6 Week Session, Spring 2019
Analysis of the operation of the market system with emphasis on the factors responsible for economic instability; analysis of public and business policies which are necessary as a result of business fluctuations.
Macroeconomic Analysis for Business Decisions: Read More [+]
Rules & Requirements
Prerequisites: Economics 1, Mathematics 1A or 16A, Statistics 21, or equivalents
Credit Restrictions: Students will receive no credit for Undergraduate Business Administration 101B after completing Economics 100B or 101B or International and Area Studies 107. A deficient grade in Economics 100B, 101B, or International and Area Studies 107 may be repeated by taking Undergraduate Business Administration 101B.
Hours & Format
Fall and/or spring: 15 weeks - 2 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
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 111
Macroeconomic Analysis for Business Decisions: Read Less [-]
UGBA 102A Introduction to Financial Accounting 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
The identification, measurement, and reporting of financial effects of events on enterprises, with a particular emphasis on business organization. Preparation and interpretation of balance sheets, income statements, and statements of cash flows.
Introduction to Financial Accounting: Read More [+]

Rules & Requirements
Credit Restrictions: Course not open for credit for students who are taking or have completed Undergraduate Business Administration W102A.

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Financial Accounting: Read Less [-]

UGBA W102A Financial Accounting 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2018 First 6 Week Session
The identification, measurement, and reporting of financial effects of events on enterprises, with a particular emphasis on business organization. Preparation and interpretation of balance sheets, income statements, and statements of cash flows.
Financial Accounting: Read More [+]

Rules & Requirements
Credit Restrictions: Course not open for credit for students who are taking or have completed Undergraduate Business Administration 102A.

Hours & Format
Summer: 6 weeks - 7.5 hours of web-based lecture per week
Online: This is an online course.

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Financial Accounting: Read Less [-]

UGBA 102B Managerial Accounting 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Spring 2019, Fall 2018
The uses of accounting systems and their outputs in the process of management of an enterprise. Classification of costs and revenue on several bases for various uses; budgeting and standard cost accounting; analyses of relevant costs and other data for decision making.
Managerial Accounting: Read More [+]

Rules & Requirements
Prerequisites: 102A

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Managerial Accounting: Read Less [-]

UGBA 103 Introduction to Finance 4 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2019 Second 6 Week Session, Spring 2019
Analysis and management of the flow of funds through an enterprise. Cash management, source and application of funds, term loans, types and sources of long-term capital. Capital budgeting, cost of capital, and financial structure. Introduction to capital markets.
Introduction to Finance: Read More [+]

Rules & Requirements
Prerequisites: 101A

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer:
6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week
8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Finance: Read Less [-]
UGBA 104 Introduction to Business Analytics
3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
This course provides an introduction to several quantitative methods used to facilitate complex decision-making in business, with applications in many different industries, at different levels in the organization, and with different scopes of decisions. The power of the methods covered in this class is further enhanced by implementing them in spreadsheet software, which allows complex problems to be approached and solved in a straightforward and understandable manner.
Introduction to Business Analytics: Read More [+]

Rules & Requirements
Prerequisites: Mathematics 1B or 16B, Statistics 21, or equivalents

Hours & Format
Fall and/or spring: 15 weeks - 1.5 hours of lecture and 1.5 hours of laboratory per week
Summer: 6 weeks - 2.5 hours of lecture and 2.5 hours of laboratory per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Business Analytics: Read Less [-]

UGBA 105 Leading People
3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
A general descriptive and analytical study of organizations from the behavioral science point of view. Problems of motivation, leadership, morale, social structure, groups, communications, hierarchy, and control in complex organizations are addressed. The interaction among technology, environment, and human behavior are considered. Alternate theoretical models are discussed.
Leading People: Read More [+]

Rules & Requirements
Credit Restrictions: Students will receive no credit for Undergrad. Business Administration 105 after completing Business Administration 150 or S150.

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 - 6 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Leading People: Read Less [-]

UGBA 106 Marketing
3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2019 Second 6 Week Session, Spring 2019
The evolution of markets and marketing; market structure; marketing cost and efficiency; public and private regulation; the development of marketing programs including decisions involving products, price, promotional distribution.
Marketing: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer:
6 weeks - 7.5 hours of lecture per week
8 weeks - 6 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Marketing: Read Less [-]
**UGBA 107 The Social, Political, and Ethical Environment of Business 3 Units**

Offered through: Business Administration  
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018  
Study and analysis of American business in a changing social and political environment. Interaction between business and other institutions. Role of business in the development of social values, goals, and national priorities. The expanding role of the corporation in dealing with social problems and issues.  
The Social, Political, and Ethical Environment of Business: Read More [+]

**Hours & Format**

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

Summer: 6 weeks - 5-7.5 hours of lecture and 2.5-0 hours of discussion per week  

**Additional Details**

**Subject/Course Level:** Undergrad. Business Administration/ Undergraduate  
**Grading/Final exam status:** Letter grade. Final exam required.  

The Social, Political, and Ethical Environment of Business: Read Less [-]

**UGBA 113 Managerial Economics 3 Units**

Offered through: Business Administration  
Terms offered: Fall 2010, Fall 2009  
Analysis of the theory and practice of decision-making in business firms, utilizing the concepts and techniques of managerial economics. The business decisions to be investigated include pricing policies, internal transfer pricing, and various choices under uncertainty.  
Managerial Economics: Read More [+]

**Rules & Requirements**

**Prerequisites:** 101A-101B or equivalents  

**Hours & Format**

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

**Additional Details**

**Subject/Course Level:** Undergrad. Business Administration/ Undergraduate  
**Grading/Final exam status:** Letter grade. Final exam not required.  

Managerial Economics: Read Less [-]

**UGBA 115 Competitive Strategy 3 Units**

Offered through: Business Administration  
Terms offered: Summer 2019 3 Week Session, Fall 2018, Summer 2018  
This course draws upon theories and frameworks from industrial organization economics, game theory, and resource-based views to address the unique challenges confronted by senior executives of organizations. The focus is strategies for competitive advantage at an organizational level. Topics include industry and competitor analysis, horizontal and vertical boundaries of the firm, strategic positioning, internal competencies, and dynamic capabilities.  
Competitive Strategy: Read More [+]

**Rules & Requirements**

**Prerequisites:** 101A or equivalent  

**Hours & Format**

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

Summer: 3 weeks - 15 hours of lecture per week  
6 weeks - 7.5 hours of lecture per week  

**Additional Details**

**Subject/Course Level:** Undergrad. Business Administration/ Undergraduate  
**Grading/Final exam status:** Letter grade. Final exam required.  

Competitive Strategy: Read Less [-]

**UGBA 117 Special Topics in Economic Analysis and Policy 1 - 4 Units**

Offered through: Business Administration  
Terms offered: Fall 2018, Spring 2018, Fall 2017  
A variety of topics in economic analysis and policy with emphasis on current problems and research.  
Special Topics in Economic Analysis and Policy: Read More [+]

**Rules & Requirements**

**Prerequisites:** 101A-101B or equivalents  

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

**Hours & Format**

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

Summer: 6 weeks - 2.5-10 hours of lecture per week  

**Additional Details**

**Subject/Course Level:** Undergrad. Business Administration/ Undergraduate  
**Grading/Final exam status:** Letter grade. Final exam required.  

Formerly known as: Business Administration 119  

Special Topics in Economic Analysis and Policy: Read Less [-]
UGBA 118 International Trade 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Summer 2018 Second 6 Week Session, Spring 2018
This course will develop models for understanding the economic causes and effects of international trade, will investigate the effects of economic policies that inhibit trade, and will examine the political economy of trade. By integrating the findings of the latest theoretical and empirical research in international economics, this course help students learn how to explore the current political debates in the U.S. and elsewhere regarding the benefits and costs of international trade.
International Trade: Read More [+]

Rules & Requirements

Prerequisites: Undergraduate Business Administration 101A or equivalent

Credit Restrictions: Students will receive no credit for Undergraduate Business Administration 118 after taking Economics 181 or Economics C181/Environmental Economics and Policy C181.

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

International Trade: Read Less [-]

UGBA 119 Leading Strategy Implementation 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
Class format consists of lectures, experiential exercises, student presentations, and case discussions. This course will cover the concepts and techniques required for successful implementation of business strategies with a particular focus on the role of effective leadership in leading strategic change.
Leading Strategy Implementation: Read More [+]

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 10 weeks - 4.5 hours of lecture per week

Online: This is an online course.

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Formerly known as: Business Administration 190

Leading Strategy Implementation: Read Less [-]

UGBA 120AA Intermediate Financial Accounting 1 4 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Fall 2018, Summer 2018 First 6 Week Session
This course introduces the student to concepts, theory and applications of financial accounting. The topics covered include accrual accounting concepts, financial statement analysis, inventory valuations, capital assets and their corresponding depreciation and impairment. Attention is given to examples on current reporting practices and to the study of reporting requirements promulgated by the Financial Accounting Standards Board ("FASB") with comparison to the International Accounting Standards Board ("IASB").
Intermediate Financial Accounting 1: Read More [+]

Rules & Requirements

Prerequisites: 102A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Intermediate Financial Accounting 1: Read Less [-]
UGBA 120AB Intermediate Financial Accounting 2 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Summer 2017 Second 6 Week Session
This course expands students’ knowledge of the concepts, theory, and application of financial accounting. It continues the technical accounting sequence, which also includes UGBA 120AA, Intermediate Accounting 1 and UGBA 120B, Advanced Financial Accounting. Topics include an in-depth treatment of the financing elements of the balance sheet and the income statement, as well as a detailed examination of the statement of cash flows.
Intermediate Financial Accounting 2: Read More [+]

Rules & Requirements

Prerequisites: UGBA 102A is required. UGBA 120AA is recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Intermediate Financial Accounting 2: Read Less [-]

UGBA 120B Advanced Financial Accounting 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Summer 2018 Second 6 Week Session
Continuation of 120A. Sources of long term capital; funds statements, financial analysis, accounting for partnerships, consolidated financial statements, adjustments of accounting data using price indexes; accounting for the financial effects of pension plans; other advanced accounting problems.
Advanced Financial Accounting: Read More [+]

Rules & Requirements

Prerequisites: UGBA 120AA and 120AB are recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Advanced Financial Accounting: Read Less [-]

UGBA 121 Federal Income Tax Accounting 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Determination of individual and corporation tax liability; influence of federal taxation on economic activity; tax considerations in business and investment decisions.
Federal Income Tax Accounting: Read More [+]

Rules & Requirements

Prerequisites: 102A (120AA recommended)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Federal Income Tax Accounting: Read Less [-]

UGBA 122 Financial Information Analysis 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
This course is designed to: 1) develop basic skills in financial statement analysis; 2) teach students to identify the relevant financial data used in a variety of decision contexts, such as equity valuation, forecasting firm-level economic variables, distress prediction and credit analysis; 3) help students appreciate the factors that influence the outcome of the financial reporting process, such as the incentives of reporting parties, regulatory rules, and a firm's competitive environment.
Financial Information Analysis: Read More [+]

Rules & Requirements

Prerequisites: 120AA

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Financial Information Analysis: Read Less [-]
UGBA 123 Operating and Financial Reporting Issues in the Financial Services Industry 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017
This course examines how accounting in the financial services industry – banking, insurance, real estate – actually operates. Students learn about underwriting and pricing in each sector, investment processes and controls, incentive-based profit sharing, risk management, and the factors that contribute to profitability. Students learn what financial statements reveal about estimates companies make regarding liabilities and, more generally, what they reveal about how companies deal with uncertainty associated with predicting and measuring financial results. Students examine the controversy over employing Fair Value Accounting across sectors and learn about other sector-specific accounting requirements. Operating and Financial Reporting Issues in the Financial Services Industry: Read More [+]
Rules & Requirements
Prerequisites: 120AA

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

UGBA W125 Professional Judgment in Accounting 3 Units
Offered through: Business Administration
Terms offered: Prior to 2007
An online course in reviewing auditing principles with a simulated audit experience over the complex areas of estimates and judgments. Professional Judgment in Accounting: Read More [+]
Rules & Requirements
Prerequisites: Preferable to have auditing completed or in progress. Must have intermediate accounting

Hours & Format
Summer: 8 weeks - 5 hours of web-based lecture and 2 hours of web-based discussion per week
Online: This is an online course.

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Professional Judgment in Accounting: Read Less [-]

UGBA 126 Auditing 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Concepts and problems in the field of professional verification of financial and related information, including ethical, legal and other professional issues, historical developments, and current concerns. Auditing: Read More [+]
Rules & Requirements
Prerequisites: 120AA (120AB and 120B recommended)

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week
Summer: 6 weeks - 7.5 hours of lecture and 2 hours of discussion per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Auditing: Read Less [-]

UGBA 127 Special Topics in Accounting 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
A variety of topics in accounting with emphasis on current problems and research. Special Topics in Accounting: Read More [+]
Rules & Requirements
Prerequisites: 102A
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture and 0-1 hours of discussion per week
Summer: 6 weeks - 2.5-10 hours of lecture and 0-2.5 hours of discussion per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Special Topics in Accounting: Read Less [-]
UGBA 128 Strategic Cost Management 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2017, Spring 2015
Managerial accounting is a company’s internal language and is used for decision-making, production management, product design and pricing, performance evaluation and motivation of employees. The objective of the course is to develop the skills and analytical ability of effectively and efficiently use managerial accounting information in order to help a company achieve its strategic and financial goals.

Strategic Cost Management: Read More [+]

Rules & Requirements
Prerequisites: 102B

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Strategic Cost Management: Read Less [-]

UGBA 129 Financial Reporting for Complex Transactions 3 Units
Offered through: Business Administration
Terms offered: Spring 2014
This course develops sophisticated users of financial information. Students will enhance their ability to understand the economic essence of important complex business transactions, focusing on topics related to major financial events in the lifecycle of an organization (IPOs, mergers and acquisitions, bankruptcies, etc.) Students’ ability to identify and understand the financial reporting and tax issues related to these business dealings and accounting situations will dramatically increase. Many fascinating transactions will be examined in an effort to understand the economic underpinnings of the transactions and their accounting representation in the financial statements.

Financial Reporting for Complex Transactions: Read More [+]

Rules & Requirements
Prerequisites: UGBA 120A

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

Summer: 8 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Financial Reporting for Complex Transactions: Read Less [-]

UGBA 131 Corporate Finance and Financial Statement Analysis 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Spring 2019, Fall 2018
This course will cover the principles and practice of business finance. It will focus on project evaluation, capital structure, and corporate governance. Firms’ policies toward debt, equity, and dividends are explored. The incentives and conflicts facing managers and owners are also discussed.

Corporate Finance and Financial Statement Analysis: Read More [+]

Rules & Requirements
Prerequisites: 103

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 hours of discussion per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Formerly known as: Business Administration 134

Corporate Finance and Financial Statement Analysis: Read Less [-]
UGBA 131A Corporate Strategy and Valuation 3 Units
Offered through: Business Administration
Terms offered: Spring 2019
The course is designed to cover advanced corporate finance issues. Its purpose is two-fold. First, it will help students develop a tool-box, both conceptual and quantitative, to address real-world corporate financial issues that they will likely use immediately in any finance-related career. Second, the course is designed to give the “the big picture,” i.e., sharpen understanding of how corporate financial strategy helps increase a firm’s value in a dynamic environment. The course examines qualitative factors that help determine financial strategy, including the costs of financial distress and the value of financial flexibility, as well as quantitative techniques, such as option pricing, that will be helpful in various analyses.

Rules & Requirements

Prerequisites: Undergraduate Business Administration 103

Hours & Format

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

UGBA 132 Financial Institutions and Markets 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2018 First 6 Week Session, Summer 2017 First 6 Week Session
Organization, behavior, and management of financial institutions. Markets for financial assets and the structure of yields, influence of Federal Reserve System and monetary policy on financial assets and institutions.

Rules & Requirements

Prerequisites: 101A-101B, and 103

Hours & Format

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

Summer: 6 weeks - 8 hours of lecture and 2.5 hours of discussion per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Formerly known as: Business Administration 132

Financial Institutions and Markets: Read Less [-]

UGBA 133 Investments 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2019 Second 6 Week Session, Fall 2018
Sources of and demand for investment capital, operations of security markets, determination of investment policy, and procedures for analysis of securities.

Rules & Requirements

Prerequisites: 103

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Investments: Read Less [-]

UGBA 134 Introduction to Financial Engineering 3 Units
Offered through: Business Administration
Terms offered: Spring 2019
This course provides students with an introduction to the application of mathematics and statistics in the field of finance. It consists of three integrated modules: 1) an introduction to the quantitative foundations of finance, using calculus, linear algebra, statistics and probability; 2) extension into financial theory as it relates to asset pricing, fixed income, derivatives, structured finance and risk management; and 3) application and implementation of these foundational tools and theory through software like Excel to build basic quantitative financial models (touching on programming). The goal is to use financial models that can guide business and financial decisions.

Rules & Requirements

Prerequisites: UGBA 103

Hours & Format

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Introduction to Financial Engineering: Read Less [-]
UGBA 136F Behavioral Finance 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Summer 2018 Second 6 Week Session, Summer 2017 Second 6 Week Session
This course explores why markets are sometimes inefficient. We consider the role that investors' heuristics and biases play in generating mispricing in financial markets. We also explore how various trading frictions limit the ability of arbitrageurs to reduce mispricing. Finally, we look at the influence of market inefficiencies on corporate decisions.
Behavioral Finance: Read More [+]
Rules & Requirements
Prerequisites: 103

UGBA 137 Special Topics in Finance 1 - 4 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Summer 2018 Second 6 Week Session, Spring 2018
A variety of topics in finance with emphasis on current problems and research.
Special Topics in Finance: Read More [+]
Rules & Requirements
Prerequisites: 103
Repeat rules: Course may be repeated for credit without restriction.

UGBA 141 Production and Operations Management 3 Units
Offered through: Business Administration
Terms offered: Spring 2017, Spring 2016, Spring 2015
A survey of the concepts and methodologies for management control of production and operations systems. Topics include inventory control, material requirements planning for multistage production systems, aggregate planning, scheduling, and production distribution.
Production and Operations Management: Read More [+]
Rules & Requirements
Prerequisites: 104 or equivalent, or consent of instructor

UGBA 143 Game Theory and Business Decisions 3 Units
Offered through: Business Administration
Terms offered: Fall 2014, Fall 2013, Spring 2010
This course provides an introduction to game theory and decision analysis. Game theory is concerned with strategic interactions among players (multi-player games), and decision analysis is concerned with making choices under uncertainty (single-player games). Emphasis is placed on applications.
Game Theory and Business Decisions: Read More [+]
Rules & Requirements
Prerequisites: Mathematics 1B or 16B, Statistics 21, or equivalent
UGBA 147 Special Topics in Operations and Information Technology Management 1 - 4 Units
Offered through: Business Administration
Terms offered: Summer 2019, Summer 2019 First 6 Week Session, Spring 2019
A variety of topics in manufacturing and information technology with emphasis on current problems and research.
Special Topics in Operations and Information Technology Management: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 2.5-10 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/
Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

UGBA 151 Management of Human Resources 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2016, Summer 2016 First 6 Week Session
The designs of systems of rewards, assessment, and manpower development. The interaction of selection, placement, training, personnel evaluation, and career ladders within an on-going organization. Role of the staff manager. Introduction of change. Implications of behavioral research for management problems and policies.
Management of Human Resources: Read More [+]

Rules & Requirements
Prerequisites: 105

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/
Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 151
Management of Human Resources: Read Less [-]

UGBA 152 Negotiation and Conflict Resolution 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
The purpose of this course is to understand the theory and processes of negotiation as practiced in a variety of settings. It is designed to be relevant to the broad spectrum of negotiation problems faced by managers and professionals. By focusing on the behavior of individuals, groups, and organizations in the context of competitive situations, the course will allow students the opportunity to develop negotiation skills experientially in useful analytical frameworks (e.g.- simulations, cases).
Negotiation and Conflict Resolution: Read More [+]

Rules & Requirements
Prerequisites: 105

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/
Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 152
Negotiation and Conflict Resolution: Read Less [-]

UGBA 154 Power and Politics in Organizations 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Fall 2018, Summer 2018 Second 6 Week Session
This course will provide students with a sense of "political intelligence." After taking this course, students will be able to: (1) diagnose the true distribution of power in organizations, (2) identify strategies for building sources of power, (3) develop techniques for influencing others, (4) understand the role of power in building cooperation and leading change in organizations, and (5) make sense of others' attempts to influence them. These skills are essential for effective and satisfying career building.
Power and Politics in Organizations: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 10 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/
Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 151
Power and Politics in Organizations: Read Less [-]
UGBA 155 Leadership 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
The purpose of this course is for the students to develop understanding of the theory and practice of leadership in various organizational settings. It is designed to allow students the opportunity to develop leadership skills through experiential exercises, behavioral and self-assessments, case studies, class discussions, and lectures.
Leadership: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Leadership: Read Less [-]

UGBA 156AC Diversity in the Workplace 3 Units
Offered through: Business Administration
Terms offered: Fall 2013, Spring 2013, Fall 2011
This course introduces students to various theories on diversity in business and the importance of human capital equity and inclusion to organizations. Students will engage in community-based projects to be more conscious of the social impact of positive human relations and to foster equity, social justice, and civic responsibility. Emphasis placed on experiential learning with issues of race, ethnicity, gender, generational status, spirituality, sexual orientation, and physical and mental ability.
Diversity in the Workplace: Read More [+]

Rules & Requirements
Prerequisites: 10, 105, 151 recommended
Requirements this course satisfies: Satisfies the American Cultures requirement

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Diversity in the Workplace: Read Less [-]

UGBA 157 Special Topics in the Management of Organizations 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
A variety of topics in organizational behavior and industrial relations with emphasis on current problems and research.
Special Topics in the Management of Organizations: Read More [+]

Rules & Requirements
Prerequisites: 105
Repeat rules: Course may be repeated for credit without restriction.

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 2.5-10 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 159
Special Topics in the Management of Organizations: Read Less [-]

UGBA 157 Consumer Behavior 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
Consumer behavior is the study of how consumers process information, form attitudes and judgments, and make decisions. Its study is critical to understand how consumers think and behave, which is critical for a company wishing to develop a customer focus. Given how different people are, it is amazing how similarly their minds work. Consumer psychology is the systematic study of how consumers perceive information, how they encode it in memory, integrate it with other sources of information, retrieve it from memory, and utilize it to make decisions. It is one of the building blocks of the study of marketing and provides the student with a set of tools with diverse applications.
Consumer Behavior: Read More [+]

Rules & Requirements
Prerequisites: 106

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Consumer Behavior: Read Less [-]
UGBA 161 Market Research: Tools and Techniques for Data Collection and Analysis
3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2017, Fall 2014
Information technology has allowed firms to gather and process large quantities of information about consumers’ choices and reactions to marketing campaigns. However, few firms have the expertise to intelligently act on such information. This course addresses this shortcoming by teaching students how to use customer information to better market to consumers. In addition, the course addresses how information technology affects marketing strategy.

Market Research: Tools and Techniques for Data Collection and Analysis: Read More [+]

Rules & Requirements

Prerequisites: 106

Hours & Format

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Market Research: Tools and Techniques for Data Collection and Analysis: Read Less [-]

UGBA 162 Brand Management and Strategy 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2017, Fall 2016
This course is an introduction to product management in marketing consumer and industrial goods and services. The course will cover analysis of market information, development of product strategy, programming strategy, and implementation.

Brand Management and Strategy: Read More [+]

Rules & Requirements

Prerequisites: 106

Hours & Format

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

Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details

Subject/Course Level: Undergrad. Business Administration/Undergraduate

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

Formerly known as: Business Administration 162

Brand Management and Strategy: Read Less [-]
UGBA 165 Advertising Strategy 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Summer 2018 First 6 Week Session, Fall 2017
Basic concepts and functions of advertising in the economy; consumer motivation; problems in utilizing advertising and measuring its effectiveness.
Advertising Strategy: Read More [+]
Rules & Requirements
Prerequisites: 106
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 165
Advertising Strategy: Read Less [-]

UGBA 167 Special Topics in Marketing 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2018, Fall 2017, Spring 2017
A variety of topics in marketing with emphasis on current problems and research.
Special Topics in Marketing: Read More [+]
Rules & Requirements
Prerequisites: 106
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 4-6 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 169
Special Topics in Marketing: Read Less [-]

UGBA 168B International Marketing 3 Units
Offered through: Business Administration
Terms offered: Spring 2015, Spring 2014
Provides frameworks, knowledge, and sensitivities to formulate and implement marketing strategies for competing in the international arena. Regions and countries covered include the Americas, Europe, Japan, China, India, Russia, Africa, and Asia-Pacific. Issues covered include global versus local advertising, international pricing strategies, selecting and managing strategic international alliances and distribution channels, managing international brands and product lines through product life cycle, international retailing, and international marketing organization and control.
International Marketing: Read More [+]
Rules & Requirements
Prerequisites: 106
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer:
6 weeks - 7.5 hours of lecture per week
8 weeks - 4-6 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
International Marketing: Read Less [-]

UGBA 169 Pricing 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Fall 2018, Summer 2018 Second 6 Week Session
This three-module course aims to equip students with proven concepts, techniques, and frameworks for assessing and formulating pricing strategies. The first module develops the economics and behavioral foundations of pricing. The second module discusses several innovative pricing concepts including price customization, nonlinear pricing, price matching, and product line pricing. The third module analyzes the strengths and weaknesses of several Internet-based, buyer-determined pricing models.
Pricing: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Pricing: Read Less [-]
UGBA 170 Ethical Leadership in Business 2
Units
Offered through: Business Administration
Terms offered: Spring 2017, Spring 2016, Spring 2015
The purpose of this class is to enhance the ability of students to anticipate, critically analyze, and appropriately respond to the wide-range social and ethical issues that challenge managers as well as individuals in their roles as citizens, consumers, investors, and employees. Instruction is based on lectures and case analysis, supplemented by topical and philosophical articles and essays.
Ethical Leadership in Business: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.

Ethical Leadership in Business: Read Less [-]

UGBA C172 History of American Business 3
Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2017, Spring 2016
This course will examine selected aspects of the history of American business. Included will be discussions of the evolution of the large corporation, the development of modern managerial techniques, and the changing relationship of business, government, and labor.
History of American Business: Read More [+]

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Rosen
Formerly known as: American Studies C172, Business Administration C172
Also listed as: AMERSTD C172

History of American Business: Read Less [-]

UGBA 175 Legal Aspects of Management 3
Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Summer 2017 Second 6 Week Session
An analysis of the law and the legal process, emphasizing the nature and functions of law within the U.S. federal system, followed by a discussion of the legal problems pertaining to contracts and related topics, business association, and the impact of law on economic enterprise.
Legal Aspects of Management: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 175

Legal Aspects of Management: Read Less [-]

UGBA 176 Innovations in Communications and Public Relations 2
Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Fall 2016
This course introduces students to public relations and how it is used by companies, non-profits and individuals to build and support their brands through innovative communication techniques. Students will hear from and have direct access to entrepreneurs and established executives who share insights on how they’ve used creative public relations campaigns and communications skills to create attention and value for their brand or avoid it in a crisis. They also learn to work in teams crafting effective media responses for an existing company needing real help now (not a case study). The semester ends with each student applying this technique to create their own personal brand that they can refine as they prepare to move into the workforce.
Innovations in Communications and Public Relations: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week
Summer: 6 weeks - 5 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Innovations in Communications and Public Relations: Read Less [-]
UGBA 177 Special Topics in Business and Public Policy 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2016, Fall 2015, Fall 2014
A variety of topics in business and public policy with emphasis on current problems and research.
Special Topics in Business and Public Policy: Read More [+]
Rules & Requirements
Prerequisites: 107
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 2.5-10 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 179
Special Topics in Business and Public Policy: Read Less [-]

UGBA 178 Introduction to International Business 3 Units
Offered through: Business Administration
Terms offered: Summer 2019 Second 6 Week Session, Spring 2019, Fall 2018
A survey involving environmental, economic, political, and social constraints on doing business abroad; effects of overseas business investments on domestic and foreign economies; foreign market analysis and operational strategy of a firm; management problems and development potential of international operations.
Introduction to International Business: Read More [+]
Rules & Requirements
Prerequisites: Undergraduate Business Administration 101A-101B or equivalents
Credit Restrictions: Students will receive no credit for Undergraduate Business Administration 178 after completing Business Administration 188. A deficient grade in Business Administration 188 may be removed by taking Undergraduate Business Administration 178.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to International Business: Read Less [-]

UGBA 179 International Consulting for Small and Medium-Sized Enterprises 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
By exploring the intersection of global business, entrepreneurship, and consulting, this course provides an understanding of how decision-makers in small and medium sized enterprises (SMEs) can develop the frameworks necessary for making decisions about how to venture across borders in pursuit of economic opportunities in today's hypercompetitive global business environment. In addition to the technical analysis of cases, there is a strong emphasis on how to create a new service company, market and sell to potential clients, manage client relationships, and leverage financial and human resources in a service setting.
International Consulting for Small and Medium-Sized Enterprises: Read More [+]
Rules & Requirements
Prerequisites: Economics 1, Mathematics 16A or 1A, or equivalents
Credit Restrictions: Students will receive no credit for Undergraduate Business Administration 178 after completing Business Administration 188. A deficient grade in Business Administration 188 may be removed by taking Undergraduate Business Administration 178.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 180
International Consulting for Small and Medium-Sized Enterprises: Read Less [-]

UGBA 180 Introduction to Real Estate and Urban Land Economics 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
The nature of real property; market analysis; construction cycles; mortgage lending; equity investment; metropolitan growth; urban land use; real property valuation; public policies.
Introduction to Real Estate and Urban Land Economics: Read More [+]
Rules & Requirements
Prerequisites: Economics 1, Mathematics 16A or 1A, or equivalents
Credit Restrictions: Students will receive no credit for Undergraduate Business Administration 178 after completing Business Administration 188. A deficient grade in Business Administration 188 may be removed by taking Undergraduate Business Administration 178.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Introduction to Real Estate and Urban Land Economics: Read Less [-]
UGBA 183 Introduction to Real Estate Finance 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2016
Real estate debt and equity financing; mortgage market structure; effects of credit on demand; equity investment criteria; public policies in real estate finance and urban development.
Introduction to Real Estate Finance: Read More [+]
Rules & Requirements
Prerequisites: 180

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 183
Introduction to Real Estate Finance: Read Less [-]

UGBA 184 Urban and Real Estate Economics 3 Units
Offered through: Business Administration
Terms offered: Spring 2016, Spring 2015, Spring 2014
This course examines how market forces influence the development of cities and the development and pricing of real estate assets. Topics include city formation; city size; land rent and land use; the operation of residential, commercial and industrial property markets; and the impacts of government policies, including the provision of public services, the imposition property taxes and fees, transportation pricing and investment, and land use regulations.
Urban and Real Estate Economics: Read More [+]
Rules & Requirements
Prerequisites: A background in microeconomics and basic calculus is preferable. Please contact the instructor if you are unsure about your preparation for this course

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Urban and Real Estate Economics: Read Less [-]

UGBA 187 Special Topics in Real Estate Economics and Finance 1 - 4 Units
Offered through: Business Administration
Terms offered: Fall 2010, Fall 2009
A variety of topics in real estate economics and finance with emphasis on current problems and research.
Special Topics in Real Estate Economics and Finance: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 2.5-10 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Special Topics in Real Estate Economics and Finance: Read Less [-]

UGBA 190S Strategy for the Information Technology Firm 3 Units
Offered through: Business Administration
Terms offered: Prior to 2007
This course is a strategy and general management course for students interested in pursuing careers in the global information technology industry. Students are taught to view the IT industry through the eyes of the general manager/CEO (whether at a start-up or an industry giant). They learn how to evaluate strategic options and their consequences, how to understand the perspectives of various industry players, and how to anticipate how they are likely to behave under various circumstances. These include the changing economics of production, the role network effects and standards have on adoption of new products and services, the tradeoffs among potential pricing strategies, and the regulatory and public policy context.
Strategy for the Information Technology Firm: Read More [+]

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 8 weeks - 6 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Strategy for the Information Technology Firm: Read Less [-]
UGBA 190T Special Topics in Innovation and Design 1 - 4 Units
Offered through: Business Administration
Terms offered: Summer 2019 First 6 Week Session, Spring 2019, Fall 2018
Advanced study in the fields of innovation and design that will address current and emerging issues. Topics will vary with each offering and will be announced at the beginning of each term.
Special Topics in Innovation and Design: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit without restriction.
Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Special Topics in Innovation and Design: Read Less [-]

UGBA 190V Corporate Strategy in Telecommunications and Media 2 Units
Offered through: Business Administration
Terms offered: Prior to 2007
This course is an intensive and in-depth study of the rapidly evolving global telecommunications and media industry viewed through the perspective of an entrepreneur/innovator (whether at a start-up or an established company) attempting to introduce a new product or service into the market. The course is fundamentally about strategy and general management, but will draw from a variety of disciplines including public policy, law, marketing, economics, finance, engineering, and physics to identify the key issues, analyze the potential options and understand the consequences of the decisions made by management.
Corporate Strategy in Telecommunications and Media: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week
Summer:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Corporate Strategy in Telecommunications and Media: Read Less [-]

UGBA 191C Communication for Leaders 2 Units
Offered through: Business Administration
Terms offered: Fall 2016, Summer 2016 10 Week Session, Summer 2016 Second 6 Week Session
This course is a workshop in the fundamentals of public speaking skills in today's business environment. Each student will give speeches, coach, and debate each other, and take part in a variety of listening and other communication exercises. The course focuses on authenticity, persuasion, and advocacy.
Communication for Leaders: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 1 hour of lecture and 2 hours of discussion per week
Summer:
6 weeks - 2.5 hours of lecture and 5 hours of discussion per week
8 weeks - 1.5 hours of lecture and 3.5 hours of discussion per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Communication for Leaders: Read Less [-]

UGBA 191I Improvisational Leadership 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Fall 2016
This class explores the broad principles of improvisation, a performing art form that has developed pedagogical methods to enhance individual spontaneity, listening and awareness, expressive skills, risk-taking, and one’s ability to make authentic social and emotional connections. The ultimate aim of the course is to help students develop an innovative and improvisational leadership mindset, sharpening in-the-moment decision making and the ability to quickly recognize and act upon opportunities when presented. In practical terms, this course strives to enhance students’ business communication skills and increase both interpersonal intuition and confidence.
Improvisational Leadership: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Improvisational Leadership: Read Less [-]
UGBA 191L Leadership Communication 1
Unit
Offered through: Business Administration
Terms offered: Prior to 2007
Leadership Communication is a workshop in the fundamentals of public speaking in today's business environment. Through prepared and impromptu speeches aimed at moving others to action, peer coaching, and lectures, students will sharpen their authentic and persuasive communication skills, develop critical listening skills, improve abilities to give, receive, and apply feedback, and gain confidence as public speakers.
Leadership Communication: Read More [+]
Hours & Format
Fall and/or spring: 2 weeks - 8 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Alternative to final exam.
Leadership Communication: Read Less [-]

UGBA 191P Leadership and Personal Development 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
This course is highly interactive and challenges you to explore questions central to your own leadership journey. The ultimate aim of the class is to help you develop a lifelong leadership development practice, where continuous personal growth is valued and actively pursued.
Leadership and Personal Development: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Leadership and Personal Development: Read Less [-]

UGBA 192A Leading Nonprofit and Social Enterprises 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
This course prepares students conceptually and practically to found, lead, and manage organizations in the nonprofit sector. The course focuses on mission and theory of change (strategy), role of the board in governance, managing and marketing to multiple constituencies, role of advocacy in meeting mission, leadership styles and managing organizational culture, resource development (philanthropy), nonprofit financial management, managing for impact, HR management (volunteering), and cross-sector alliances.
Leading Nonprofit and Social Enterprises: Read More [+]
Rules & Requirements
Prerequisites: 101A or equivalent
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Formerly known as: Business Administration 115
Leading Nonprofit and Social Enterprises: Read Less [-]

UGBA 192AC Social Movements and Social Media 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2017, Fall 2016
This course provides a survey of innovative social movements and their complex relationships to social media technologies. It will examine the evolution from pre-social-media to present-day mobilizing strategies and the interplay between explicitly policy- and advocacy-focused approaches and related efforts rooted in music, visual arts, popular culture and celebrities. The course will place into comparative relief the discourses of explicitly racially- or ethnically-defined movements and movements that mobilize based on other, sometimes overlapping categories of marginalization including class, immigration status, gender identity and occupational category.
Social Movements and Social Media: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Instructor: David Harris
Social Movements and Social Media: Read Less [-]
UGBA 192B Strategic Philanthropy 2 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
This course teaches students the concepts and practices of effective philanthropy. It offers students the experience of studying relevant theories and frameworks for assessing potential grant recipients and a real-world grant making experience in which they complete a series of nonprofit organizational assessments and then make actual grants totaling $10,000 to a limited number of organizations. Students learn about the evolution of the philanthropic sector from traditional entities, such as private, corporate and community foundations, to an array of new funding intermediaries, technology-driven philanthropies, open source platforms, “impact” investors, and venture philanthropy partnerships.

UGBA 192L Applied Impact Evaluation 2 Units
Offered through: Business Administration
Terms offered: Prior to 2007
This course covers the methods and applications of impact evaluations, which is the science of measuring the causal impact of a program or policy on outcomes of interest. At its essence, impact evaluation is about generating evidence on which policies work, and which don’t. This subject matter should appeal to three main audiences: (1) those in decision-making positions, such as policy makers and business leaders, and need to consume the information generated from impact evaluations to make informed evidence-based decisions, (2) project managers, development practitioners and business managers who commission impact evaluations and (3) researchers who actually design and implement impact evaluations.

UGBA 192N Topics in Social Sector Leadership 1 - 5 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Advanced study in the field of social sector leadership that will address current and emerging issues. Topics will vary with each offering and will be announced at the beginning of each term.

UGBA 192P Sustainable Business Consulting Projects 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2016, Fall 2014
Discuss the field of strategic corporate social responsibility (CSR) through a series of lectures, guest speakers, and projects. The course will examine best practices used by companies to engage in socially responsible business practices. It will provide students with a flavor of the complex dilemmas one can face in business in trying to do both “good for society” and “well for shareholders.” It looks at CSR from a corporation perspective, and how this supports core business objectives, core competencies, and bottom-line profits.
UGBA 192T Topics in Corporate Social Responsibility 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Summer 2018 First 6 Week Session
Advanced study in the field of corporate social responsibility that will address current and emerging issues. Topics will vary with each offering and will be announced at the beginning of each term.
Topics in Corporate Social Responsibility: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer: 6 weeks - 2.5-10 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Topics in Corporate Social Responsibility: Read Less [-]

UGBA 193B Energy & Civilization 4 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Fall 2016
Energy is one of the main drivers of civilization. Today we are at the precipice of what many hope will be a major paradigm shift in energy production and use. Two transitions are needed. On the one hand, we must find ways to extend the benefits of our existing energy system to the impoverished people living in the developing world while continuing to provide these benefits to the people of the developed world. On the other hand, we must completely overhaul the existing system to fight climate change and other forms of air and water pollution. Are these shifts truly within our reach? Can we achieve both simultaneously? If so, how? This Big Ideas course will grapple with these questions using an interdisciplinary systems approach.

Energy & Civilization: Read More [+]

Rules & Requirements
Credit Restrictions: Students who take UGBA 193B will not receive credit for L&S 126.

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Energy & Civilization: Read Less [-]

UGBA 193C Curricular Practical Training for International Students 0.0 Units
Offered through: Business Administration
Terms offered: Summer 2014 10 Week Session, Summer 2013 10 Week Session, Summer 2012 10 Week Session
This is a zero-unit internship course for non-immigrant international students participating in internships under the Curricular Practical Training program. Requires a paper exploring how the theoretical constructs learned in UGBA courses were applied during the internship.

Curricular Practical Training for International Students: Read More [+]

Rules & Requirements
Prerequisites: International students only

Hours & Format
Fall and/or spring: 15 weeks - 0 hours of internship per week
Summer: 6 weeks - 0 hours of internship per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.
Curricular Practical Training for International Students: Read Less [-]

UGBA 193I Business Abroad 4 - 6 Units
Offered through: Business Administration
Terms offered: Summer 2019 8 Week Session, Summer 2018 Second 6 Week Session, Summer 2017 Second 6 Week Session
This course includes both formal learning in lectures, experiential learning, and action research through site visits abroad. Students and instructor will visit with international companies and/or organizations to learn about the business opportunities and challenges of operating in a specific country or region. Evaluation is based on student participation, presentations, and a research paper. Country and business industry focus may vary from term to term depending upon the instructor.

Business Abroad: Read More [+]

Rules & Requirements
Prerequisites: To be determined by instructor depending on topic
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 4-6 hours of lecture per week
Summer: 5 weeks - 16-25 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Business Abroad: Read Less [-]
UGBA 194 Undergraduate Colloquium on Business Topics 1 Unit
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Fall 2017
This is a speakers series course designed to give students insights from practitioners into complex issues facing American business leaders. Each week a guest speaker will discuss an issue related to a particular theme, ranging from corporate governance to the social responsibilities of business. Students will be challenged to synthesize, question, and extend those insights under the guidance of the instructor.
Undergraduate Colloquium on Business Topics: 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 lecture per week
Summer: 6 weeks - 2.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.
Undergraduate Colloquium on Business Topics: Read Less [-]

UGBA 195A Entrepreneurship 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Spring 2018, Spring 2017
Do you have an idea for a new business, but want to learn how to more fully develop this idea? Would you like to receive funding for your business idea, but lack a framework to ask for capital? This course takes students through the new venture process using a business plan as the main deliverable. A well-written business plan sets key milestones and indicates the resources needed to achieve them, in an increasingly complex business environment. Through the planning process that tightly links market and financial planning a business plan creates a set of standards to which investors and teammates can evaluate actual performance, laying the foundation for an "operating plan" once the business is launched.
Entrepreneurship: Read More [+] Hours & Format
Fall and/or spring: 15 weeks - 2 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Entrepreneurship: Read Less [-]

UGBA 195P Entrepreneurship: How to Successfully start a New Business 3 Units
Offered through: Business Administration
Terms offered: Fall 2018, Fall 2017, Fall 2016
This course explores and examines key issues facing entrepreneurs and their businesses. It is intended to provide a broad spectrum of topics across many business disciplines including accounting, finance, marketing, organizational behavior, production/quality, technology, etc. Students will acquire a keen understanding of both the theoretical and real world tools used by today's entrepreneurial business leaders in achieving success in today's global business environment.
Entrepreneurship: How to Successfully start a New Business: Read More [+] Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 6 weeks - 7.5 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Entrepreneurship: How to Successfully start a New Business: Read Less [-]

UGBA 195S Entrepreneurship To Address Global Poverty 3 Units
Offered through: Business Administration
Terms offered: Spring 2013, Spring 2012, Spring 2011
This course examines whether and how entrepreneurial ventures can meaningfully address global poverty vs. more traditional approaches such as foreign aid, private philanthropy or corporate social responsibility initiatives. Combining lectures, case studies, and interviews with social entrepreneurs, it explores poverty and entrepreneurship before focusing on their intersection in various bottom-of-pyramid markets, from health, housing, and education to energy, agriculture, and finance.
Entrepreneurship To Address Global Poverty: Read More [+] Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Entrepreneurship To Address Global Poverty: Read Less [-]
UGBA 195T Topics in Entrepreneurship 1 - 3 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Courses of this kind will cover issues in entrepreneurship that either appeal to a specialized interest by type of firm being started (e.g., new ventures in computer software) or in the aspect of the entrepreneurial process being considered (e.g., new venture funding). The courses typically will be designed to take advantage of the access offered by the University and the locale to knowledgeable and experienced members of the business community.

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

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

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

UGBA 196 Special Topics in Business Administration 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2019, Fall 2018, Spring 2018
Study in various fields of business administration. Topics will vary from year to year and will be announced at the beginning of each semester.

Rules & Requirements
Prerequisites: Upper division standing
Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format
Fall and/or spring: 15 weeks - 1-4 hours of lecture per week
Summer:
6 weeks - 2.5-10 hours of lecture per week
10 weeks - 2-4 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Formerly known as: Business Administration 196

UGBA 198 Directed Study 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2016, Fall 2015, Spring 2015
Organized group study on topics selected by upper division students under the sponsorship and direction of a member of the Haas School of Business faculty.

Rules & Requirements
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:
6 weeks - 2.5-10 hours of lecture per week
10 weeks - 2-4 hours of lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.
UGBA 199 Supervised Independent Study and Research 1 - 4 Units
Offered through: Business Administration
Terms offered: Spring 2015, Spring 2014, Fall 2013
Enrollment restrictions apply.
Supervised Independent Study and Research: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

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

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

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

Additional Details

Subject/Course Level: Undergrad. Business Administration/
Undergraduate

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

Formerly known as: Business Administration 199

Supervised Independent Study and Research: Read Less [-]