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 open to freshmen during the UC application period (November 1 - 30). Freshman admission is limited to a maximum of 50 students. Beginning Fall 2021, current UC Berkeley students in the College of Engineering majoring in one of the M.E.T. tracks may apply to M.E.T. via the Continuing Student Admissions process.

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 is 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/search/?P=UGBA%20194), UGBA 198 (http://guide.berkeley.edu/search/?P=UGBA%20198) and UGBA 199 (http://guide.berkeley.edu/search/?P=UGBA%20199) (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 must complete their business prerequisite courses (including Reading & Composition A & B) by the spring semester of their sophomore (2nd) year.
8. Two M.E.T. Special Topics courses are required. M.E.T. Special Topics courses will count as upper division business units.
9. 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/ #collegerequirementstext).

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>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>3-5</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 26</td>
<td>Three-Dimensional Modeling for Design</td>
<td>2</td>
</tr>
<tr>
<td>ENGIN 29</td>
<td>Manufacturing and Design Communication</td>
<td>4</td>
</tr>
<tr>
<td>ENGIN 78</td>
<td>Statistics and Data Science for Engineers</td>
<td>4</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>Reading &amp; Composition Parts A &amp; B</td>
<td>4-4</td>
<td></td>
</tr>
</tbody>
</table>

1 CHEM 4A is intended for students majoring in chemistry or a closely-related field.
2 ENGIN 78 will fulfill the Statistics prerequisite for Haas. The course must be completed by spring semester, sophomore year.

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 100</td>
<td>Electronics for the Internet of Things</td>
<td>4</td>
</tr>
<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>4</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 1,2,3,4

Select at least one course from the Quantitative Science elective list:

- MEC ENG C13
- ENGIN 128  Advanced Engineering Design Graphics [3]
- MEC ENG 101 Introduction to Lean Manufacturing Systems [3]
- MEC ENG 110 Introduction to Product Development [3]
- MEC ENG C11 Structural Aspects of Biomaterials [4]
- MEC ENG 118 Introduction to Nanotechnology and Nanoscience [3]
- MEC ENG 119 Introduction to MEMS (Microelectromechanical Systems) [3]
- MEC ENG 130 Design of Planar Machinery [3]
- MEC ENG 133 Mechanical Vibrations [3]
- MEC ENG 135 Design of Microprocessor-Based Mechanical Systems [4]
- MEC ENG 146 Energy Conversion Principles [3]
- MEC ENG 151 Advanced Heat Transfer [3]
- MEC ENG 165 Ocean-Environment Mechanics [3]
- MEC ENG C178 Orthopedic Biomechanics [4]
- MEC ENG C17 Designing for the Human Body [4]
- MEC ENG 179 Augmenting Human Dexterity [4]

Select at least one course from the Quantitative Science elective list:

- ENGIN 117  Methods of Engineering Analysis [3]
- ENGIN 150  Basic Modeling and Simulation Tools for Industrial Research Applications [3]
- ENGIN 177  Advanced Programming with MATLAB [3]
- MEC ENG 120 Computational Biomechanics Across Multiple Scales [3]
- MEC ENG 131 Vehicle Dynamics and Control [4]
- MEC ENG C134/EL ENG C128
- MEC ENG 136 Introduction to Control of Unmanned Aerial Vehicles [3]
- MEC ENG C18 Engineering Analysis Using the Finite Element Method [3]
- MEC ENG 193 Special Topics in Controls [1-4] 1

1 Technical electives: 15 units of technical electives (https://me.berkeley.edu/undergraduate/technical-electives/) are required, of which at least 9 units must be upper division mechanical engineering courses. Any upper division course taught by mechanical engineering faculty may be used as part of the 9 units of upper division mechanical engineering courses. In addition, ENGIN 117, ENGIN 128, ENGIN 150, and ENGIN 177 can count toward the 9 units of upper division mechanical engineering courses. 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. MEC ENG 193B is a Special Topics course and is only approved for a Quantitative Science Elective when it is offered as “Feedback Control of Legged Robots.”

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

3 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, CHM ENG 185, 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, ENGIN 185, ENGIN 187, 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.

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

**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  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 117  Special Topics in Economic Analysis and Policy  1-4
- UGBA 118  International Trade  3
- UGBA 120AA  Intermediate Financial Accounting  1
- UGBA 120AB  Intermediate Financial Accounting  2
- UGBA 120B  Advanced Financial Accounting  4
- UGBA 121  Federal Income Tax Accounting  4
- UGBA 122  Financial Information Analysis  4
- UGBA 123  Operating and Financial Reporting Issues in the Financial Services Industry  3
- UGBA 125  Ethics 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 131A Corporate Strategy and Valuation 3
UGBA 132 Financial Institutions and Markets 3
UGBA 133 Investments 3
UGBA 134 Introduction to Financial Engineering 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 3
UGBA 155 Leadership 3
UGBA 157 Special Topics in the Management of Organizations 1-4
UGBA 160 Customer Insights 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 164 Marketing Strategy 3
UGBA 165 Advertising Strategy 3
UGBA 167 Special Topics in Marketing 1-4
UGBA 169 Pricing 3
UGBA C172 History of American Business 3
UGBA 173 Competitive Strategy 3
UGBA 174 Leading Strategy Implementation 3
UGBA 175 Legal Aspects of Management 3
UGBA 176 Innovations in Communications and Public Relations 2
UGBA 177 Special Topics in Business and Public Policy 1-4
UGBA 178 Introduction to International Business 3
UGBA 179 International Consulting for Small and Medium-Sized Enterprises 3
UGBA 180 Introduction to Real Estate and Urban Land Economics 3
UGBA 183 Introduction to Real Estate Finance 3
UGBA 184 Urban and Real Estate Economics 3
UGBA 187 Special Topics in Real Estate Economics and Finance 1-4
UGBA 190S Strategy for the Information Technology Firm 3
UGBA 190T Special Topics in Innovation and Design 1-4
UGBA 191C Communication for Leaders 2
UGBA 191I Improvisational Leadership 3
UGBA 191L Leadership Communication 1
UGBA 191P Leadership and Personal Development 3
UGBA 192A Leading Nonprofit and Social Enterprises 3
UGBA 192AC Social Movements and Social Media 3
UGBA 192B Strategic Philanthropy 2
UGBA 192L Applied Impact Evaluation 2
UGBA 192N Topics in Social Sector Leadership 1-5
UGBA 192P Sustainable Business Consulting Projects 3
UGBA 192T Topics in Responsible Business 1-4
UGBA 193B Energy & Civilization 4
UGBA 193C Practical Training 0.0
UGBA 193I Business Abroad 4-6
UGBA 194 Undergraduate Colloquium on Business Topics 1
UGBA 195A Entrepreneurship 3
UGBA 195P Entrepreneurship: How to Successfully start a New Business 3
UGBA 195S Entrepreneurship To Address Global Poverty 3
UGBA 195T Topics in Entrepreneurship 1-3
UGBA 196 Special Topics in Business Administration 1-4
UGBA 198 Directed Study 1-4
UGBA 199 Supervised Independent Study and Research 1-4

University of California Requirements

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 US 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.
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.

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.

• Passed grades may account for no more than one third of the total units completed at UC Berkeley. Fall Program for Freshmen (FFP), UC Education Abroad Program (UCEAP), or UC Berkeley Washington Program (UCDC) toward the 120 overall minimum unit requirement. Transfer credit is not factored into the limit. This includes transfer units from outside of the UC system, other UC campuses, credit-bearing exams, as well as UC Berkeley Extension XB units.

University of California Requirements

Entry Level Writing (https://www.ucop.edu/elwr/)

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/education/#universityrequirementstext)

The American History and Institutions requirements are based on the principle that a U.S. resident who has graduated from an American university should have an understanding of the history and governmental institutions of the United States.

Campus Requirement

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

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

The American Cultures requirement and courses constitute an approach that responds directly to the problem encountered in numerous disciplines of how better to present the diversity of American experience to the diversity of American students whom we now educate.

Faculty members from many departments teach American Cultures courses, but all courses have a common framework. The courses focus on themes or issues in United States history, society, or culture;
address theoretical or analytical issues relevant to understanding race, culture, and ethnicity in American society; take substantial account of groups drawn from at least three of the following: African Americans, indigenous peoples of the United States, Asian Americans, Chicano/ Latino Americans, and European Americans; and are integrative and comparative in that students study each group in the larger context of American society, history, or culture.

This is not an ethnic studies requirement, nor a Third World cultures requirement, nor an adjusted Western civilization requirement. These courses focus upon how the diversity of America’s constituent cultural traditions have shaped and continue to shape American identity and experience.

Visit the Class Schedule (http://classes.berkeley.edu/) or the American Cultures website (http://americancultures.berkeley.edu/) for the specific American Cultures courses offered each semester. For a complete list of approved American Cultures courses at UC Berkeley and California Community Colleges, please see the American Cultures Subcommittee’s website (https://academic-senate.berkeley.edu/committees/amcult/). See your academic adviser if you have questions about your responsibility to satisfy the American Cultures breadth requirement.

<table>
<thead>
<tr>
<th>Fall Units</th>
<th>Spring Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1A1</td>
<td>4 MATH 1B</td>
</tr>
<tr>
<td>CHEM 1A (or CHEM 4A)2</td>
<td>3 PHYSICS 7A2</td>
</tr>
<tr>
<td>ENGIN 26</td>
<td>2 Reading &amp; Composition Part B Course5</td>
</tr>
<tr>
<td>Reading &amp; Composition Part A Course5</td>
<td>4 ENGIN 7</td>
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<tr>
<td>Breadth-Historical Studies/AC3</td>
<td>4 UGBA 10</td>
</tr>
<tr>
<td>M.E.T. Special Topics Course (UGBA 196)12</td>
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<thead>
<tr>
<th>Freshman Fall Units</th>
<th>Freshman Spring Units</th>
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</thead>
<tbody>
<tr>
<td>MATH 53</td>
<td>4 MATH 54</td>
</tr>
<tr>
<td>PHYSICS 7B</td>
<td>4 MEC ENG 40</td>
</tr>
<tr>
<td>ENGIN 29</td>
<td>4 MEC ENG C85 or GIV ENG C30</td>
</tr>
<tr>
<td>Breadth-Arts and Literature/AC3</td>
<td>4 ENGIN 7B11</td>
</tr>
<tr>
<td>ECON 1 or 2 (Breadth-Social &amp; Behavioral)3,4</td>
<td>4 Breadth-International Studies3,9,10</td>
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<table>
<thead>
<tr>
<th>Sophomore Fall Units</th>
<th>Sophomore Spring Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEC ENG 104</td>
<td>3 MEC ENG 108</td>
</tr>
<tr>
<td>MEC ENG 106</td>
<td>3 MEC ENG 105</td>
</tr>
<tr>
<td>MEC ENG 100</td>
<td>4 Tech Elective (QS Requirement)3,9,10</td>
</tr>
<tr>
<td>UGBA 100</td>
<td>2 Tech Elective (ME Upper Div)3,9,10</td>
</tr>
<tr>
<td>UGBA 101A (also Tech Elective)8,9,10</td>
<td>3 UGBA Elective13</td>
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<thead>
<tr>
<th>Junior Fall Units</th>
<th>Junior Spring Units</th>
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<tbody>
<tr>
<td>UGBA 106</td>
<td>3 UGBA 107 (Breadth - Philosophy &amp; Values)5</td>
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</tbody>
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<table>
<thead>
<tr>
<th>M.E.T. Special Topics (UGBA 196)12</th>
<th>UGBA 101B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (also Tech Elective)9,10</td>
<td>3 (also Tech Elective)9,10</td>
</tr>
</tbody>
</table>

**Total Units: 149**

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 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 (or ECON 2) 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. 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 and Literature exam. A 5 on the AP English Literature and Composition exam, or a score of 5 or higher on the IB Higher Level English Language and Literature exam will fulfill Reading & Composition part A and part B.

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.
Technical electives: 15 units of technical electives (https://me.berkeley.edu/undergraduate/technical-electives/) are required, of which at least 9 units must be upper division mechanical engineering courses. Of these 9 units, 3 units must be a design (https://me.berkeley.edu/undergraduate/design-elective/) course selected from the following:

EL ENG C128/MEC ENG C134*, ENGIN 128, MEC ENG 101, MEC ENG 110, MEC ENG C117, MEC ENG 118, MEC ENG 119, MEC ENG 130, MEC ENG 133, MEC ENG 135, MEC ENG 146, MEC ENG 151, MEC ENG 165, MEC ENG C176, MEC ENG C178 MEC ENG 179. Also, one of the technical elective courses must be selected from the quantitative science list (https://me.berkeley.edu/undergraduate/quantitative-science/): ENGIN 117, ENGIN 150, ENGIN 177, MEC ENG 120, MEC ENG 131, MEC ENG C134/EL ENG C128*, MEC ENG 136, MEC ENG C180, or MEC ENG 193B. (MEC ENG 193B is a Special Topics course and is only approved for QS when it is offered as “Feedback Control of Legged Robots.”) *EL ENG C128/MEC ENG C134 can be used as either the Design Elective or the Quantitative Science Elective, but not both. Any upper division course taught by mechanical engineering faculty may be used as part of the 9 units of upper division mechanical engineering courses. In addition, ENGIN 117, ENGIN 128, ENGIN 150, and ENGIN 177 can count toward the 9 units of upper division mechanical engineering courses. Students may receive up to three units of technical elective credit for work on a research project in either MEC ENG 196 or MEC ENG H194. To complete the Aerospace Engineering concentration, students must complete MEC ENG 163, MEC ENG 136 and MEC ENG 127 as part of their technical electives.

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, ENGIN 11, EECS 16B, EPS 50, INTEGBI C32, MATH 55, MAT SCI 45, MCELLB 32, PHYSICS 7C, STAT 20, STAT 21. Other courses may count via petition.

Technical electives cannot include:

- Any course taken on a Pass/No Pass basis
- Any course that counts as M.E.T. Breadth
- Courses numbered 24, 39, 84, or 88
- Any of the following courses: BIO ENG 100, COMPSCI C79, DES INV courses (except DES INV 15, DES INV 90E, DES INV 190E), ENGIN 125, ENGIN 157AC, ENGIN 180, ENGIN 185, ENGIN 187, 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.

ENGIN 78 will fulfill the Statistics prerequisite for Haas. The course must be completed by spring semester, sophomore year.

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

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 lifelong 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](http://www.haas.berkeley.edu/Undergrad/learninggoals.html)).

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

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

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

View the Management, Entrepreneurship, & Technology (M.E.T.) Major Map PDF. ([https://ue.berkeley.edu/sites/default/files/management_entrepreneurship_and_technology.pdf](https://ue.berkeley.edu/sites/default/files/management_entrepreneurship_and_technology.pdf))

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**MEC ENG 24 Freshman Seminars 1 Unit**

**Terms offered:** Spring 2022, Fall 2021, Spring 2021

The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.

Freshman Seminars: Read More [+]

**Rules & Requirements**

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

**Hours & Format**

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

**Additional Details**

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

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

Freshman Seminars: Read Less [-]
MEC ENG 40 Thermodynamics 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 10 Week Session
This course introduces the scientific principles that deal with energy conversion among different forms, such as heat, work, internal, electrical, and chemical energy. The physical science of heat and temperature, and their relations to energy and work, are analyzed on the basis of the four fundamental thermodynamic laws (zeroth, first, second, and third). These principles are applied to various practical systems, including heat engines, refrigeration cycles, air conditioning, and chemical reacting systems.
Thermodynamics: Read More [+]

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

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

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

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Thermodynamics: Read Less [-]

MEC ENG C85 Introduction to Solid Mechanics 3 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
Introduction to Solid Mechanics: Read More [+]

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

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

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Summer:
6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week
10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructors: Armero, Papadopoulos, Zohdi, Johnson
Also listed as: CIV ENG C30

Introduction to Solid Mechanics: Read Less [-]
MEC ENG W85 Introduction to Solid Mechanics 3 Units
Terms offered: Summer 2021 8 Week Session, Summer 2020 8 Week Session, Summer 2019 8 Week Session

Introduction to Solid Mechanics: Read More [+]

Objectives & Outcomes

Course Objectives: To learn statics and mechanics of materials

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

Rules & Requirements

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

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

Hours & Format

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

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

Online: This is an online course.

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Govindjee

Also listed as: CIV ENG W30

Introduction to Solid Mechanics: Read Less [-]
MEC ENG 100 Electronics for the Internet of Things 4 Units

Terms offered: Spring 2022, Fall 2021, Spring 2021

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

Electronics for the Internet of Things: Read More [+]

Objectives & Outcomes:

Course Objectives: Electronics has become a powerful and ubiquitous technology supporting solutions to a wide range of applications in fields ranging from science, engineering, healthcare, environmental monitoring, transportation, to entertainment. This course teaches students majoring in these and related subjects how to use electronic devices to solve problems in their areas of expertise. Through the lecture and laboratory, students gain insight into the possibilities and limitations of the technology and how to use electronics to help solve problems. Students learn to use electronics to interact with the environment through sound, light, temperature, motion using sensors and actuators, and how to use electronic computation to orchestrate the interactions and exchange information wirelessly over the internet.

The course has two objectives: (a) to teach students how to build electronic circuits that interact with the environment through sensors and actuators and how to communicate wirelessly with the internet to cooperate with other devices and with humans, and (b) to offer a broad survey of modern Electrical Engineering including analog electronics: analysis of RLC circuits, filtering, diodes and rectifiers, op-amps, A2D and D2A converters; digital electronics: combinatorial and sequential logic, flip-flops, counters, memory; applications: communication systems, signal processing, computer architecture; basics of manufacturing of integrated circuits.

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

Rules & Requirements:

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

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

Hours & Format:

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

Additional Details:

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructors: Dornfeld, McMains

Introduction to Lean Manufacturing Systems: Read Less [-]

MEC ENG 101 Introduction to Lean Manufacturing Systems 3 Units

Terms offered: Spring 2021, Spring 2019, Spring 2018

Fundamentals of lean manufacturing systems including manufacturing fundamentals, unit operations and manufacturing line considerations for work in process (WIP), manufacturing lead time (MLT), economics, quality monitoring; high mix/low volume (HMLV) systems fundamentals including just in time (JIT), kanban, buffers and line balancing; class project/case studies for design and analysis of competitive manufacturing systems.

Introduction to Lean Manufacturing Systems: Read More [+]

Objectives & Outcomes:

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

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

Rules & Requirements:

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

Hours & Format:

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

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

Additional Details:

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructors: Dornfeld, McMains

Introduction to Lean Manufacturing Systems: Read Less [-]
MEC ENG 102B Mechatronics Design 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
Introduction to design and realization of mechatronics systems. Micro computer architectures. Basic computer I/O devices. Embedded microprocessor systems and control, I/O programming such as analogue to digital converters, PWM, serial and parallel outputs. Electrical components such as power supplies, operational amplifiers, transformers and filters. Shielding and grounding. Design of electric, hydraulic and pneumatic actuators. Design of sensors. Design of power transmission systems. Kinematics and dynamics of robotics devices. Basic feedback design to create robustness and performance.
Mechatronics Design: Read More [+]

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

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

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.

MEC ENG 103 Experimentation and Measurements 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
This course introduces students to modern experimental techniques for mechanical engineering, and improves students' teamwork and communication skills. Students will work in a laboratory setting on systems ranging in complexity from desktop experiments with only a few instruments up to systems such as an internal combustion engine with a wide variety of sensors. State-of-the-art software for data acquisition and analysis will be introduced and used throughout the course. The role of error and uncertainty, and uncertainty propagation, in measurements and analysis will be examined. Design of experiments will be addressed through examples and homework. The role and limitations of spectral analysis of digital data will be discussed.
Experimentation and Measurements: Read More [+]

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

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to function on multi-disciplinary teams
(d) an ability to identify, formulate, and solve engineering problems
(e) an understanding of professional and ethical responsibility
(f) an ability to communicate effectively
(g) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(h) a recognition of the need for, and an ability to engage in life-long learning
(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: MEC ENG 40; MEC ENG C85 / CIV ENG C30; MEC ENG 100; MEC ENG 106 (can be taken concurrently), and MEC ENG 109 (can be taken concurrently)

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructors: Johnson, Makiharju, Chen
Experimentation and Measurements: Read Less [-]
MEC ENG 104 Engineering Mechanics II 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 10 Week Session
This course is an introduction to the dynamics of particles and rigid bodies. The material, based on a Newtonian formulation of the governing equations, is illustrated with numerous examples ranging from one-dimensional motion of a single particle to planar motions of rigid bodies and systems of rigid bodies.

Engineering Mechanics II: Read More [+]

Rules & Requirements
Prerequisites: MEC ENG C85 and ENGIN 7

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Ma

MEC ENG 106 Fluid Mechanics 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 10 Week Session
This course introduces the fundamentals and techniques of fluid mechanics with the aim of describing and controlling engineering flows.

Fluid Mechanics: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week
Summer: 10 weeks - 4.5 hours of lecture and 1.5 hours of discussion per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Fluid Mechanics: Read Less [-]

MEC ENG C106A Introduction to Robotics 4 Units
Terms offered: Fall 2021, Fall 2020, Spring 2020, Fall 2019
This course is an introduction to the field of robotics. It covers the fundamentals of kinematics, dynamics, control of robot manipulators, robotic vision, sensing, forward & inverse kinematics of serial chain manipulators, the manipulator Jacobian, force relations, dynamics, & control. We will present techniques for geometric motion planning & obstacle avoidance. Open problems in trajectory generation with dynamic constraints will also be discussed. The course also presents the use of the same analytical techniques as manipulation for the analysis of images & computer vision. Low level vision, structure from motion, & an introduction to vision & learning will be covered. The course concludes with current applications of robotics.

Introduction to Robotics: Read More [+]

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

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

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion, and 3 hours of laboratory per week
Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 6 hours of laboratory per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Sastry
Also listed as: BIO ENG C106A/EECS C106A

Introduction to Robotics: Read Less [-]
MEC ENG 108 Mechanical Behavior of Engineering Materials 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
This course covers elastic and plastic deformation under static and dynamic loads. Failure by yielding, fracture, fatigue, wear, and environmental factors are also examined. Topics include engineering materials, heat treatment, structure-property relationships, elastic deformation and multiaxial loading, plastic deformation and yield criteria, dislocation plasticity and strengthening mechanisms, creep, stress concentration effects, fracture, fatigue, and contact deformation. Mechanical Behavior of Engineering Materials: Read More [+]

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

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

Rules & Requirements
Prerequisites: MEC ENG C85 / CIV ENG C30

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

MEC ENG 109 Heat Transfer 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 10 Week Session
This course covers transport processes of mass, momentum, and energy from a macroscopic view with emphasis both on understanding why matter behaves as it does and on developing practical problem solving skills. The course is divided into four parts: introduction, conduction, convection, and radiation.
Heat Transfer: Read More [+]

Rules & Requirements
Prerequisites: MEC ENG 40 and MEC ENG 106

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Heat Transfer: Read Less [-]

MEC ENG 110 Introduction to Product Development 3 Units
Terms offered: Spring 2022, Summer 2021 10 Week Session, Spring 2021
The course provides project-based learning experience in innovative new product development, with a focus on mechanical engineering systems. Design concepts and techniques are introduced, and the student's design ability is developed in a design or feasibility study chosen to emphasize ingenuity and provide wide coverage of engineering topics. Relevant software will be integrated into studio sessions, including solid modeling and environmental life cycle analysis. Design optimization and social, economic, and political implications are included.
Introduction to Product Development: Read More [+]

Rules & Requirements
Prerequisites: Junior or higher standing

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.

Introduction to Product Development: Read Less [-]
MEC ENG C115 Molecular Biomechanics and Mechanobiology of the Cell 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
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.

Molecular Biomechanics and Mechanobiology of the Cell: Read More [+]

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

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

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Mofrad
Also listed as: BIO ENG C112

MEC ENG C117 Structural Aspects of Biomaterials 4 Units
Terms offered: Fall 2020, Spring 2019, Spring 2018
This course covers the structure and mechanical functions of load bearing tissues and their replacements. Natural and synthetic load-bearing biomaterials for clinical applications are reviewed. Biocompatibility of biomaterials and host response to structural implants are examined. Quantitative treatment of biomechanical issues and constitutive relationships of tissues are covered in order to design biomaterial replacements for structural function. Material selection for load bearing applications including reconstructive surgery, orthopedics, dentistry, and cardiology are addressed. Mechanical design for longevity including topics of fatigue, wear, and fracture are reviewed. Case studies that examine failures of devices are presented.

Structural Aspects of Biomaterials: Read More [+]

Rules & Requirements
Prerequisites: BIOLOGY 1A and MAT SCI 45; CIV ENG 130, CIV ENG 130N, or BIO ENG 102
Credit Restrictions: Students will receive no credit for Mechanical Engineering C117 after completing Mechanical Engineering C215/ Bioengineering C222.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Pruitt
Also listed as: BIO ENG C117

Structural Aspects of Biomaterials: Read Less [-]
MEC ENG 118 Introduction to Nanotechnology and Nanoscience 3 Units
Terms offered: Spring 2021, Spring 2020, Spring 2017
This course introduces engineering students (juniors and seniors) to the field of nanotechnology and nanoscience. The course has two components: (1) Formal lectures. Students receive a set of formal lectures introducing them to the field of nanotechnology and nanoscience. The material covered includes nanofabrication technology (how one achieves the nanometer length scale, from "bottom up" to "top down" technologies), the interdisciplinary nature of nanotechnology and nanoscience (including areas of chemistry, material science, physics, and molecular biology), examples of nanoscience phenomena (the crossover from bulk to quantum mechanical properties), and applications (from integrated circuits, quantum computing, MEMS, and bioengineering). (2) Projects. Students are asked to read and present a variety of current journal papers to the class and lead a discussion on the various works.

Introduction to Nanotechnology and Nanoscience: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Lin, Sohn

Introduction to Nanotechnology and Nanoscience: Read Less [-]

MEC ENG 119 Introduction to MEMS (Microelectromechanical Systems) 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
Fundamentals of microelectromechanical systems including design, fabrication of microstructures; surface-micromachining, bulk-micromachining, LIGA, and other micro machining processes; fabrication principles of integrated circuit device and their applications for making MEMS devices; high-aspect-ratio microstructures; scaling issues in the micro scale (heat transfer, fluid mechanics and solid mechanics); device design, analysis, and mask layout.

Introduction to MEMS (Microelectromechanical Systems): Read More [+]

Rules & Requirements

Prerequisites: PHYSICS 7B and MEC ENG 100

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
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.)

Computational Biomechanics Across Multiple Scales: Read More [+]

Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Mofrad

Computational Biomechanics Across Multiple Scales: Read Less [-]

MEC ENG 122 Processing of Materials in Manufacturing 3 Units
Terms offered: Spring 2020, Spring 2018, Spring 2017
Fundamentals of manufacturing processes (metal forming, forging, metal cutting, welding, joining, and casting); selection of metals, plastics, and other materials relative to the design and choice of manufacturing processes; geometric dimensioning and tolerancing of all processes.

Processing of Materials in Manufacturing: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Processing of Materials in Manufacturing: Read Less [-]
MEC ENG 125 Industry-Associated Capstones in Mechanical Engineering (iACME) 4 Units
Terms offered: Spring 2018
iACME provide opportunities for Mechanical Engineering undergraduates to tackle real-world engineering problems. Student teams, consisting of no more than four students, will apply to work on specific industry-initiated projects. Teams will be selected based on prior experience in research/internships, scholastic achievements in ME courses, and most importantly, proposed initial approaches toward tackling the specific project. ME faculty, alumni of the Mechanical Engineering Department, and industry participants will mentor selected teams. Projects fall within a wide range of mechanical engineering disciplines, e.g. biomedical, automotive/transportation, energy, design, etc.
Industry-Associated Capstones in Mechanical Engineering (iACME): Read More [+]

Objectives & Outcomes

Course Objectives: The purpose of this course is to:
• learn the fundamental concepts of approaching practical engineering problems;
• enhance skills in communication with clients and other engineers;
• enhance skills in design, prototyping, testing, and analysis.

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

Rules & Requirements

Prerequisites: Senior standing and a minimum GPA of 3.0

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: O'Connell , Sohn

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

MEC ENG 126 The Science and Engineering of Cooking 4 Units
Terms offered: Spring 2022
This course will discuss concepts from the physical sciences and engineering (e.g. heat and mass transfer, phase transitions, fluid mechanics, etc.) that serve as a foundation for everyday cooking and haute cuisine. The course will integrate the expertise of visiting chefs from the Bay Area (and beyond) who will serve as guest lecturers and present their cooking techniques. These unique opportunities will be complemented by lectures that investigate in-depth the science and engineering that underlie these techniques.
The Science and Engineering of Cooking: Read More [+]

Rules & Requirements

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

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Sohn

The Science and Engineering of Cooking: Read Less [-]
MEC ENG 127 Introduction to Composite Materials 3 Units
Terms offered: Spring 2022, Spring 2021, Spring 2011
Imagine a material that offers mechanical properties that are competitive with aluminum and steel but are at fractions of their weight – these materials are termed as composites. Composite materials are used for many applications such as aircraft structures, biomedical devices, racing car bodies, and many others for their capability to be stronger, lighter, and cheaper when compared to traditional materials. In this class, students will delve into the theory to design composite structures, processing techniques to manufacture them, and structural testing methods for validation. Starting from traditional fiber-reinforced composite materials, this course will also bring in new concepts such as nanocomposites and bioinspired composites.

Introduction to Composite Materials: Read More [+]

Objectives & Outcomes

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

Student Learning Outcomes: A knowledge of contemporary issues. An ability to design and conduct experiments, as well as to analyze and interpret data. An understanding of professional and ethical responsibility. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. A recognition of the need for, and an ability to engage in life-long learning. An ability to apply knowledge of mathematics, science, and engineering. An ability to communicate effectively. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. An ability to function on multi-disciplinary teams. An ability to identify, formulate, and solve engineering problems. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. Students completing this course will have the facility for designing robust composite structures subjected to various types of loads. Students will also be able to assess the effects of long-term loading, including damage generation, delamination fracture and fatigue failure. Additionally, students will be exposed to how composites are used in various applications in aerospace, biomedical, sports, among other fields.

Rules & Requirements

Prerequisites: MEC ENG C85 / CIV ENG C30

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

MEC ENG 130 Design of Planar Machinery 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
Synthesis, analysis, and design of planar machines. Kinematic structure, graphical, analytical, and numerical analysis and synthesis. Linkages, cams, reciprocating engines, gear trains, and flywheels.

Design of Planar Machinery: Read More [+]

Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Youseffi

Design of Planar Machinery: Read Less [-]
MEC ENG 131 Vehicle Dynamics and Control
4 Units
Terms offered: Spring 2021, Spring 2020, Spring 2019
Physical understanding of automotive vehicle dynamics including simple lateral, longitudinal and ride quality models. An overview of active safety systems will be introduced including the basic concepts and terminology, the state-of-the-art development, and basic principles of systems such as ABS, traction control, dynamic stability control, and roll stability control. Passive, semi-active and active suspension systems will be analyzed. Concepts of autonomous vehicle technology including drive-by-wire and steer-by-wire systems, adaptive cruise control and lane keeping systems. Design of software control systems for an actual 1/10 scale race vehicle.

Vehicle Dynamics and Control: Read More [+]

Objectives & Outcomes

Course Objectives: At the end of the course the students should be able to:

a. Formulate simple but accurate dynamic models for automotive longitudinal, lateral and ride quality analysis.

b. Assess the stability of dynamic systems using differential equation theory, apply frequency-response methods to assess system response to external disturbances, sensor noise and parameter variations.

c. Have a basic understanding of modern automotive safety systems including ABS, traction control, dynamic stability control and roll control.

d. Follow the literature on these subjects and perform independent design, research and development work in this field.

e. Expected to design feedback control systems for an actual 1/010 scaled vehicle platform which will be distributed to every group of two students in the class

Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(g) an ability to communicate effectively
(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 1B, MATH 53, MATH 54, PHYSICS 7A, PHYSICS 7B, ENGIN 7 (or alternate programming course), and MEC ENG 132

Hours & Format

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

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

MEC ENG 132 Dynamic Systems and Feedback
3 Units
Terms offered: Fall 2021, Summer 2021 10 Week Session, Fall 2020

Dynamic Systems and Feedback: Read More [+]

Rules & Requirements

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

Hours & Format

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

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

Dynamic Systems and Feedback: Read Less [-]
MEC ENG 133 Mechanical Vibrations 3 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
An introduction to the theory of mechanical vibrations including topics of harmonic motion, resonance, transient and random excitation, applications of Fourier analysis and convolution methods. Multidegree of freedom discrete systems including principal mode, principal coordinates and Rayleigh’s principle.
Mechanical Vibrations: Read More [+]

Objectives & Outcomes

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

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

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

Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer: 10 weeks - 5 hours of lecture per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.

MEC ENG C134 Feedback Control Systems 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021, Fall 2020
Analysis and synthesis of linear feedback control systems in transform and time domains. Control system design by root locus, frequency response, and state space methods. Applications to electro-mechanical and mechatronics systems.
Feedback Control Systems: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Also listed as: EL ENG C128

Feedback Control Systems: Read Less [-]

MEC ENG 135 Design of Microprocessor-Based Mechanical Systems 4 Units
Terms offered: Spring 2022, Spring 2020, Spring 2019
This course provides preparation for the conceptual design and prototyping of mechanical systems that use microprocessors to control machine activities, acquire and analyze data, and interact with operators. The architecture of microprocessors is related to problems in mechanical systems through study of systems, including electro-mechanical components, thermal components and a variety of instruments. Laboratory exercises lead through studies of different levels of software. Design of Microprocessor-Based Mechanical Systems: Read More [+]

Rules & Requirements

Prerequisites: ENGIN 7

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Instructor: Kazerooni

Design of Microprocessor-Based Mechanical Systems: Read Less [-]
MEC ENG 136 Introduction to Control of Unmanned Aerial Vehicles 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
This course introduces students to the control of unmanned aerial vehicles (UAVs). The course will cover modeling and dynamics of aerial vehicles, and common control strategies. Laboratory exercises allow students to apply knowledge on a real system, by programming a microcontroller to control a UAV.

Introduction to Control of Unmanned Aerial Vehicles: Read More [+]

Objectives & Outcomes

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

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

Rules & Requirements

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

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Mueller

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

MEC ENG 138 Introduction to Micro/Nano Mechanical Systems Laboratory 3 Units
Terms offered: Spring 2018, Spring 2015, Spring 2013
This hands-on laboratory course focuses on the mechanical engineering principles that underlie the design, fabricaton, and operation of micro/nanoscale mechanical systems, including devices made by nanowire/nanotube syntheses; photolithography/soft lithography; and molding processes. Each laboratory will have different focuses for basic understanding of MEMS/NEMS systems from prototype constructions to experimental testings using mechanical, electrical, or optical techniques.

Introduction to Micro/Nano Mechanical Systems Laboratory: Read More [+]

Rules & Requirements

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

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Mueller

Introduction to Micro/Nano Mechanical Systems Laboratory: Read Less [-]
MEC ENG 139 Robotic Locomotion 4 Units
Terms offered: Fall 2021
This course provides students with a basic understanding of robotic locomotion and the use of kinematics, dynamics, control algorithms, embedded microcomputers and mechanical components in designing artificial legs such as prosthetics, orthotics and exoskeletons. Robotic Locomotion: Read More [+]

Objectives & Outcomes

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

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

Rules & Requirements

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

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Kazerooni

Robotic Locomotion: Read Less [-]

MEC ENG 140 Combustion Processes 3 Units
Terms offered: Fall 2020, Fall 2019, Fall 2018
Fundamentals of combustion, flame structure, flame speed, flammability, ignition, stirred reaction, kinetics and nonequilibrium processes, pollutant formation. Application to engines, energy production and fire safety. Combustion Processes: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructors: Fernandez-Pello, Chen

Combustion Processes: Read Less [-]

MEC ENG 146 Energy Conversion Principles 3 Units
Terms offered: Fall 2018, Spring 2018, Fall 2016
This course covers the fundamental principles of energy conversion processes, followed by development of theoretical and computational tools that can be used to analyze energy conversion processes. The course also introduces the use of modern computational methods to model energy conversion performance characteristics of devices and systems. Performance features, sources of inefficiencies, and optimal design strategies are explored for a variety of applications, which may include conventional combustion based and Rankine power systems, energy systems for space applications, solar, wind, wave, thermoelectric, and geothermal energy systems. Energy Conversion Principles: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Carey

Energy Conversion Principles: Read Less [-]
MEC ENG 150A Solar-Powered Vehicles: Analysis, Design and Fabrication 3 Units
Terms offered: Summer 2015 10 Week Session, Summer 2014 10 Week Session, Spring 2014
This course addresses all aspects of design, analysis, construction and economics of solar-powered vehicles. It begins with an examination of the fundamentals of photovoltaic solar power generation, and the capabilities and limitations that exist when using this form of renewable energy. The efficiency of energy conversion and storage will be evaluated across an entire system, from the solar energy that is available to the mechanical power that is ultimately produced. The structural and dynamic stability, as well as the aerodynamics, of vehicles will be studied. Safety and economic concerns will also be considered. Students will work in teams to design, build and test a functioning single-person vehicle capable of street use.

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

Objectives & Outcomes

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

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

Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 3 hours of laboratory per week
Summer: 10 weeks - 3 hours of lecture and 4.5 hours of laboratory per week

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.

Advanced Heat Transfer: Read Less [-]
MEC ENG 151A Conductive and Radiative Transport 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
Objectives & Outcomes
Course Objectives: The course will provide students with knowledge of the physics of conductive transport in solids, the analysis of steady and transient heat conduction by both analytical and numerical methods and the treatment of phase change problems. Furthermore, the course will provide students with knowledge of radiative properties, the mechanisms of radiative transfer and will present theory and methods of solution of radiative transfer problems in participating and nonparticipating media.
Student Learning Outcomes: Students will gain knowledge of the mechanisms of conductive transfer and will develop the ability to quantify steady and transient temperature in important engineering problems often encountered (e.g. manufacturing, materials processing, bio-thermal treatment and electronics cooling) by applying analytical methods and by constructing numerical algorithms. Students will also gain knowledge of the fundamental radiative properties and the mechanisms of radiative transport in enclosures, absorbing, emitting and scattering media as well as the interaction of thermal radiation with other modes of heat transfer.
Rules & Requirements
Prerequisites: Undergraduate courses in engineering thermodynamics, fluid dynamics and heat transfer (MEC ENG 40, MEC ENG 106, and MEC ENG 109). Each student must have access to a PC, Macintosh or workstation machine with scientific programming capabilities for use in homework and projects
Credit Restrictions: Students who have taken ME 151 or ME 250A will not receive credit.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Grigopoulos
Conductive and Radiative Transport: Read Less [-]

MEC ENG 151B Convective Transport and Computational Methods 3 Units
Terms offered: Spring 2020, Spring 2019
The transport of heat and mass in fluids in motion; free and forced convection in laminar and turbulent flow over surfaces and within ducts. Fundamentals of computational methods used for solving the governing transport equations will also be covered. Convective Transport and Computational Methods: Read More [+]
Objectives & Outcomes
Course Objectives: This course will provide students with knowledge of the physics of convective transport and an introduction to computational tools that can model convective processes in important applications such as electronics cooling, aerospace thermal management. The course also teaches students to construct computational models of natural and forced convection processes in boundary layers nears surfaces, in enclosures and in ducts or pipes that can be used to design heat exchangers and thermal management equipment for applications.
Student Learning Outcomes: (a) an ability to apply knowledge of mathematics, science, and engineering (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (d) an ability to function on multi-disciplinary teams (e) an ability to identify, formulate, and solve engineering problems (g) an ability to communicate effectively (j) a knowledge of contemporary issues (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Rules & Requirements
Prerequisites: Undergraduate courses in engineering thermodynamics, fluid dynamics and heat transfer (MEC ENG 40, MEC ENG 106, and MEC ENG 109). Each student must have access to a PC, Macintosh or workstation machine with scientific programming capabilities for use in homework and projects
Credit Restrictions: Students should not receive credit for this course if they have taken ME 252 or ME 250B.
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Carey
Convective Transport and Computational Methods: Read Less [-]
MEC ENG 153 Applied Optics and Radiation 3 Units
Terms offered: Prior to 2007
Applied Optics and Radiation: Read More [+]

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

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

Students will gain knowledge of the EM theory, optical properties of materials, principles of spectroscopy for gases, liquids and solids, principles and applications of lasers and optical diagnostics. Students will develop the ability to design optical instrumentation systems in the context of key industrial applications, including additive manufacturing, materials processing, bio-optics, semiconductor industry applications, reacting systems, forensics.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Grigoropoulos

MEC ENG 154 Thermophysics for Applications 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 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 knowledge of contemporary issues
an ability to apply knowledge of mathematics, science, and engineering
an ability to communicate effectively
an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
an ability to function on multi-disciplinary teams
an ability to identify, formulate, and solve engineering problems

Students will gain knowledge of the EM theory, optical properties of materials, principles of spectroscopy for gases, liquids and solids, principles and applications of lasers and optical diagnostics. Students will develop the ability to design optical instrumentation systems in the context of key industrial applications, including additive manufacturing, materials processing, bio-optics, semiconductor industry applications, reacting systems, forensics.

Rules & Requirements
Prerequisites: MEC ENG 40
Credit Restrictions: Student will not receive credit for this course if they have taken ME 254.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructors: Frenklach, Carey

Thermophysics for Applications: Read Less [-]
MEC ENG 160 Ocean Engineering Seminar 2
Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
Lectures on new developments in ocean, offshore, and arctic engineering.
Ocean Engineering Seminar: Read More [+]

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

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

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.
Instructors: Makiharju, Alam

Ocean Engineering Seminar: Read Less [-]

MEC ENG 163 Engineering Aerodynamics 3
Units
Terms offered: Fall 2021, Summer 2021 10 Week Session, Spring 2021
Introduction to the lift, drag, and moment of two-dimensional airfoils, three-dimensional wings, and the complete airplane. Calculations of the performance and stability of airplanes in subsonic flight. The course run on two loosely aligned parallel tracks: a traditional sequence of lectures covering the basic topics in aerodynamics and a set of projects on vortex dynamics and aerodynamics that are loosely aligned with lectures. The distinguishing factor will be the extend of the projects assigned to the graduate level participants, which will be substantially more involved than those expected from the senior level participants.

Engineering Aerodynamics: Read More [+]

Rules & Requirements
Prerequisites: MEC ENG 40, MEC ENG 106

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Savas

Engineering Aerodynamics: Read Less [-]

MEC ENG 164 Marine Statics and Structures
3 Units
Terms offered: Fall 2012, Fall 2011, Fall 2009
Terminology and definition of hull forms, conditions of static equilibrium and stability of floating submerged bodies. Effects of damage on stability. Structural loads and response. Box girder theory. Isotropic and orthotropic plate bending and bucking.

Marine Statics and Structures: Read More [+]

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

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Mansour
Formerly known as: C164

Marine Statics and Structures: Read Less [-]
MEC ENG 165 Ocean-Environment Mechanics 3 Units
Terms offered: Spring 2020, Spring 2018, Spring 2017
Ocean-Environment Mechanics: Read More [+]

Rules & Requirements
Prerequisites: MEC ENG 106 or CIV ENG 100
Credit Restrictions: Students will receive no credit for 165 after taking C165/Ocean Engineering C165.

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Yeung
Formerly known as: C165
Ocean-Environment Mechanics: Read Less [-]

MEC ENG 167 Microscale Fluid Mechanics 3 Units
Terms offered: Spring 2018, Spring 2016, Spring 2015
Phenomena of physical, technological, and biological significance in flows of gases and liquids at the microscale. The course begins with familiar equations of Newtonian fluid mechanics, then proceeds to the study of essentially 1-D flows in confined geometries with the lubrication equations. Next is a study of the flow of thin films spreading under gravity or surface tension gradients. Lubrication theory of compressible gases leads to consideration of air bearings. Two- and 3-D flows are treated with Stokes’ equations. Less familiar physical phenomena of significance and utility at the microscale are then considered: intermolecular forces in liquids, slip, diffusion and bubbles as active agents. A review of relevant aspects of electricity and magnetism precedes a study of electrowetting and electrokinetically driven liquid flows.
Microscale Fluid Mechanics: Read More [+]

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructors: Morris, Szeri
Microscale Fluid Mechanics: Read Less [-]
MEC ENG 168 Mechanics of Offshore Systems 3 Units
Terms offered: Fall 2020, Spring 2019, Fall 2017
This course covers major aspects of offshore engineering including ocean environment, loads on offshore structures, cables and mooring, underwater acoustics and arctic operations. Mechanics of Offshore Systems: Read More [+]

Objectives & Outcomes

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

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

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Alam

Mechanics of Offshore Systems: Read Less [-]

MEC ENG 170 Engineering Mechanics III 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
This course builds upon material learned in 104, examining the dynamics of particles and rigid bodies moving in three dimensions. Topics include non-fixed axis rotations of rigid bodies, Euler angles and parameters, kinematics of rigid bodies, and the Newton-Euler equations of motion for rigid bodies. The course material will be illustrated with real-world examples such as gyroscopes, spinning tops, vehicles, and satellites. Applications of the material range from vehicle navigation to celestial mechanics, numerical simulations, and animations. Engineering Mechanics III: Read More [+]

Rules & Requirements

Prerequisites: MEC ENG 104 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructors: O'Reilly, Casey

Engineering Mechanics III: Read Less [-]

MEC ENG 173 Fundamentals of Acoustics 3 Units
Terms offered: Spring 2017, Spring 2013, Spring 2011

Rules & Requirements

Prerequisites: MEC ENG 104

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Johnson

Fundamentals of Acoustics: Read Less [-]
MEC ENG 174 Nonlinear and Random Vibrations 3 Units  
Terms offered: Spring 2021  
Nonlinear and Random Vibrations: Read More [+]

Objectives & Outcomes

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

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

An ability to apply knowledge of mathematics, science, and engineering. An ability to identify, formulate, and solve engineering problems. The broad education necessary to understand the impact of engineering solutions in a global and societal context. A knowledge of contemporary issues. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

This course provides valuable training in the modeling and analysis of mechanical engineering systems using nonlinear and uncertainty analysis. It also serves to reinforce and emphasize the connection between fundamental engineering science and practical problem solving.

Rules & Requirements

Prerequisites: MEC ENG 104

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Ma

Intermediate Dynamics: Read Less [-]

MEC ENG 175 Intermediate Dynamics 3 Units  
Terms offered: Spring 2022, Fall 2021, Fall 2020  
This course introduces and investigates Lagrange's equations of motion for particles and rigid bodies. The subject matter is particularly relevant to applications comprised of interconnected and constrained discrete mechanical components. The material is illustrated with numerous examples. These range from one-dimensional motion of a single particle to three-dimensional motions of rigid bodies and systems of rigid bodies. 
Intermediate Dynamics: Read More [+]

Objectives & Outcomes

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

Student Learning Outcomes: This course provides valuable training in the modeling and analysis of mechanical engineering systems using systems of particles and/or rigid bodies. It also serves to reinforce and emphasize the connection between fundamental engineering science and practical problem-solving.

a) An ability to apply knowledge of mathematics, science, and engineering.

Rules & Requirements

Prerequisites: MEC ENG 104

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructors: O'Reilly, Casey

Intermediate Dynamics: Read Less [-]
MEC ENG C176 Orthopedic Biomechanics 4 Units
Terms offered: Fall 2020, Fall 2019, Spring 2019
Statics, dynamics, optimization theory, composite beam theory, beam-on-elastic foundation theory, Hertz contact theory, and materials behavior. Forces and moments acting on human joints; composition and mechanical behavior of orthopedic biomaterials; design/analysis of artificial joint, spine, and fracture fixation prostheses; musculoskeletal tissues including bone, cartilage, tendon, ligament, and muscle; osteoporosis and fracture-risk predication of bones; and bone adaptation. MATLAB-based project to integrate the course material.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Keaveny
Also listed as: BIO ENG C119
Orthopedic Biomechanics: Read Less [-]

MEC ENG C178 Designing for the Human Body 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
The course provides project-based learning experience in understanding product design, with a focus on the human body as a mechanical machine. Students will learn the design of external devices used to aid or protect the body. Topics will include forces acting on internal materials (e.g., muscles and total replacement devices), forces acting on external materials (e.g., prothetics and crash pads), design/analysis of devices aimed to improve or fix the human body, muscle adaptation, and soft tissue injury. Weekly laboratory projects will incorporate EMG sensing, force plate analysis, and interpretation of data collection (e.g., MATLAB analysis) to integrate course material to better understand contemporary design/analysis/problems.

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

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

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

Rules & Requirements
Prerequisites: PHYSICS 7A, MATH 1A, and MATH 1B. Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed.
Credit Restrictions: There will be no credit given for MEC ENG C178 / BIO ENG C137 after taking MEC ENG 178.

Hours & Format
Fall and/or spring: 15 weeks - 1-3 hours of lecture per week.
MEC ENG 179 Augmenting Human Dexterity 4 Units

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

Augmenting Human Dexterity: Read More [+]

Objectives & Outcomes

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

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

Rules & Requirements

Prerequisites: MEC ENG 132; MEC ENG C178 / BIO ENG C137 or MEC ENG C176 / BIO ENG C119; and proficiency with Matlab or equivalent program

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

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. Alternative to final exam.

Instructor: Stuart

Augmenting Human Dexterity: Read Less [-]

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

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

Engineering Analysis Using the Finite Element Method: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Also listed as: CIV ENG C133

Engineering Analysis Using the Finite Element Method: Read Less [-]
MEC ENG 184 Flight Vehicle Structures and Aeroelasticity 3 Units
Terms offered: Not yet offered
This course introduces engineering students to the analysis and design of load-bearing components of flight structures, ranging from subsonic aircraft to rockets. Emphasis is placed on the quasi-static and dynamic analysis of structural components which are prevalent in aerospace engineering. Attention is also devoted to a comprehensive design roadmap of flight vehicle structures from the full system- to the individual component-level.

Flight Vehicle Structures and Aeroelasticity: Read More [+]

Objectives & Outcomes

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

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

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

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

(g) A knowledge of contemporary issues.

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

Ability to design and conduct experiments, as well as to analyze and interpret data.

Ability to identify, formulate, and solve engineering problems.

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

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

Understanding of professional and ethical responsibility.

Rules & Requirements

Prerequisites: CIV ENG C30 / MEC ENG C85 and MEC ENG 104

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Papadopoulos

Flight Vehicle Structures and Aeroelasticity: 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.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Packard
Practical Control System Design: A Systematic Loopshaping Approach: Read Less [-]

MEC ENG 190M Model Predictive Control 1 Unit
Terms offered: Spring 2015, Fall 2009
Basics on optimization and polyhedra manipulation. Analysis and design of constrained predictive controllers for linear and nonlinear systems.

Rules & Requirements
Prerequisites: MEC ENG 132

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam not required.
Instructor: Borrelli
Model Predictive Control: Read Less [-]

MEC ENG 190Y Practical Control System Design: A Systematic Optimization Approach 1 Unit
Terms offered: Spring 2013, Spring 2010, Spring 2009
The Youla-parametrization of all stabilizing controllers allows certain time-domain and frequency-domain closed-loop design objectives to be cast as convex optimizations, and solved reliably using off-the-shelf numerical optimization codes. This course covers the Youla parametrization, basic elements of convex optimization, and finally control design using these techniques.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Packard
Practical Control System Design: A Systematic Optimization Approach: Read Less [-]

MEC ENG 191K Professional Communication 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
This course is designed to enhance students' written and oral communication skills. Written work consists of informal documents—correspondence, internal reports, and reviews—and formal work—proposals, conference papers, journal articles, and websites. Presentations consist of informal and formal reports, including job and media interviews, phone interviews, conference calls, video conferences, progress reports, sales pitches, and feasibility studies.

Rules & Requirements
Prerequisites: Reading and Composition parts A and B

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture per week
Summer:
6 weeks - 8 hours of lecture per week
8 weeks - 5.5 hours of lecture per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Professional Communication: Read Less [-]
MEC ENG 193A Special Topics in Biomechanical Engineering 1 - 4 Units
Terms offered: Spring 2017
This 193 series covers current topics of research interest in biomechanical engineering. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Biomechanical Engineering: Read More [+]

Objectives & Outcomes

Course Objectives: Course objectives will vary.

Student Learning Outcomes: Student outcomes will vary.

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

Instructor: Faculty

Special Topics in Biomechanical Engineering: Read Less [-]

MEC ENG 193B Special Topics in Controls 1 - 4 Units
Terms offered: Spring 2022, Fall 2020, Fall 2019
This 193 series covers current topics of research interest in controls. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Controls: Read More [+]

Objectives & Outcomes

Course Objectives: Will vary with course.

Student Learning Outcomes: Will vary with course.

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate

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

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.

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 More [+]

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.

Objectives & Outcomes
Course Objectives: Will vary with course.
Student Learning Outcomes: Will vary with course.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty

Special Topics in Dynamics: Read Less [-]
MEC ENG 193E Special Topics in Energy Science and Technology 1 - 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
This 193 series covers current topics of research interest in energy science and technology. The course content may vary semester to semester. Check with the department for current term topics.

Objectives & Outcomes

Course Objectives: Will vary with course.
Student Learning Outcomes: Will vary with course.

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

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

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty

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

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

Special Topics in Fluids: Read More [+]

Special Topics in Energy Science and Technology: Read Less [-]
MEC ENG 193G Special Topics in Manufacturing 1 - 4 Units
Terms offered: Prior to 2007
This 193 series covers current topics of research interest in manufacturing. The course content may vary semester to semester. Check with the department for current term topics. Special Topics in Manufacturing: Read More [+]

Objectives & Outcomes

Course Objectives: Will vary by course.
Student Learning Outcomes: Will vary by course.

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty

Special Topics in Manufacturing: Read Less [-]

MEC ENG 193H Special Topics in Materials 1 - 4 Units
Terms offered: Spring 2020
This 193 series covers current topics of research interest in materials. The course content may vary semester to semester. Check with the department for current term topics. Special Topics in Materials: Read More [+]

Objectives & Outcomes

Course Objectives: Will vary with course.
Student Learning Outcomes: Will vary with course.

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty

Special Topics in Materials: Read Less [-]
MEC ENG 193I Special Topics in Mechanics 1
- 4 Units
Terms offered: Prior to 2007
This 193 series covers current topics of research interest in mechanics. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in Mechanics: Read More [+]
Objectives & Outcomes
Course Objectives: Will vary with course.
Student Learning Outcomes: Will vary with course.
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.
Hours & Format
Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty
Special Topics in Mechanics: Read Less [-]

MEC ENG 193J Special Topics in MEMS/Nano
1 - 4 Units
Terms offered: Prior to 2007
This 193 series covers current topics of research interest in MEMS/nano. The course content may vary semester to semester. Check with the department for current term topics.
Special Topics in MEMS/Nano: Read More [+]
Objectives & Outcomes
Course Objectives: Will vary with course.
Student Learning Outcomes: Will vary with course.
Rules & Requirements
Repeat rules: Course may be repeated for credit when topic changes.
Hours & Format
Fall and/or spring:
6 weeks - 2.5-10 hours of lecture per week
8 weeks - 2-7.5 hours of lecture per week
10 weeks - 1.5-6 hours of lecture per week
15 weeks - 1-4 hours of lecture per week
Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Letter grade. Final exam required.
Instructor: Faculty
Special Topics in MEMS/Nano: Read Less [-]
MEC ENG 193K Special Topics in Ocean Engineering 1 - 4 Units
Terms offered: Prior to 2007
This 193 series covers current topics of research interest in ocean engineering. The course content may vary semester to semester. Check with the department for current term topics.

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

MEC ENG H194 Honors Undergraduate Research 2 - 4 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 8 Week Session
Final report required. Students who have completed a satisfactory number of advanced courses may pursue original research under the direction of one of the members of the faculty. A maximum of three units of H194 may be used to fulfill technical elective requirements in the Mechanical Engineering program (unlike 198 or 199, which do not satisfy technical elective requirements). Students can use a maximum of three units of graded research units (H194 or 196) towards their technical elective requirement.

Objectives & Outcomes

Course Objectives: Will vary by course.

Student Learning Outcomes: Will vary by course.

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

Instructor: Faculty

Additional Details

Instructor: Faculty
MEC ENG 196 Undergraduate Research 2 - 4 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
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.

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 More [+]

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.

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

Hours & Format
Fall and/or spring: 15 weeks - 3-12 hours of internship per week
Summer: 6 weeks - 8-30 hours of internship per week
10 weeks - 5-18 hours of internship per week

Additional Details
Subject/Course Level: Mechanical Engineering/Undergraduate
Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

Undergraduate Engineering Field Studies: Read Less [-]
MEC ENG 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
Group study of a selected topic or topics in Mechanical Engineering. Credit for 198 or 199 courses combined may not exceed 4 units in any single term. See College for other restrictions.
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 2022, Fall 2021, Spring 2021
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 2021, Fall 2020, Fall 2019
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 2022, Spring 2021, Spring 2020  
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/NUC ENG C226

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

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**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: Fall 2019
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.

Nanoscale Processing of Materials: Read More [+]

Objectives & 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
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.

Advanced Manufacturing Systems Analysis, AMS: Read More [+]

Objectives & 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

Advanced Manufacturing Systems Analysis, AMS: Read Less [-]
MEC ENG C205 Critical Making 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020, Spring 2019, Spring 2018
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
MEC ENG 206A Introduction to Robotics 4 Units
Terms offered: Fall 2021
This course is an introduction to the field of robotics. It covers the fundamentals of kinematics, dynamics, and control of robot manipulators, robotic vision, and sensing. The course deals with forward and inverse kinematics of serial chain manipulators, the manipulator Jacobian, force relations, dynamics, and control. It presents elementary principles on proximity, tactile, and force sensing, vision sensors, camera calibration, stereo construction, and motion detection. The course concludes with current applications of robotics in active perception, medical robotics, autonomous vehicles, and other areas.

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/Graduate
Grading: Letter grade.
Instructor: Sreenath

Introduction to Robotics: Read More [+]

MEC ENG C206A Introduction to Robotics 4 Units
Terms offered: Not yet offered
This course is an introduction to the field of robotics. It covers the fundamentals of kinematics, dynamics, control of robot manipulators, robotic vision, sensing, forward & inverse kinematics of serial chain manipulators, the manipulator Jacobian, force relations, dynamics, & control. We will present techniques for geometric motion planning & obstacle avoidance. Open problems in trajectory generation with dynamic constraints will also be discussed. The course also presents the use of the same analytical techniques as manipulation for the analysis of images & computer vision. Low level vision, structure from motion, & an introduction to vision & learning will be covered. The course concludes with current applications of robotics.

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/Graduate
Grading: Letter grade.
Instructors: Sastry, Sreenath
Formerly known as: Electrical Engin and Computer Sci 206A
Also listed as: EECS C206A

Introduction to Robotics: Read Less [-]
MEC ENG C210 Advanced Orthopedic Biomechanics 4 Units
Terms offered: Fall 2020, Fall 2019, Spring 2019
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.
Advanced Orthopedic Biomechanics: Read More [+]

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, 1 hour of discussion, and 1 hour of laboratory per week

Additional Details

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

Also listed as: BIO ENG C209

Advanced Orthopedic Biomechanics: Read Less [-]

MEC ENG 211 The Cell as a Machine 3 Units
Terms offered: Fall 2019, 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.
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 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.
Heat and Mass Transport in Biomedical Engineering: Read More [+]

Rules & Requirements

Prerequisites: 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/Graduate
Grading: Letter grade.
Formerly known as: Mechanical Engineering 212
Also listed as: BIO ENG C212
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.
Also listed as: BIO ENG C214
Advanced Tissue Mechanics: Read Less [-]

MEC ENG C215 Advanced Structural Aspects of Biomaterials 4 Units
Terms offered: Fall 2020, Spring 2019, Spring 2018
This course covers the structure and mechanical functions of load bearing tissues and their replacements. 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.
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 2022, Spring 2021, Spring 2020
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 cytoskelton 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; BIO ENG 102 or MEC ENG C85; or instructor’s 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.
Instructor: Mofrad
Also listed as: BIO ENG C215

Molecular Biomechanics and Mechanobiology of the Cell: Read More [+]

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

Biomimetic Engineering -- Engineering from Biology: Read Less [-]
MEC ENG 218N Introduction to Nanotechnology and Nanoscience 3 Units
Terms offered: Spring 2021, Spring 2020
UG and Grad. introduction to nanotechnology and nanoscience. The course has two components: 1) Students receive a set of formal lectures introducing nanotechnology and nanoscience, covering 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 present on a variety of current journal papers to the class & lead discussion.

Introduction to Nanotechnology and Nanoscience: Read More [+]

Objectives & Outcomes
Course Objectives: To introduce and provide a broad view of the nascent field of nanoscience and nanotechnology to undergraduates. To introduce students to inter- and multi-disciplinary science and engineering.

Student Learning Outcomes: A recognition of the need for, and an ability to engage in life-long learning. A knowledge of contemporary issues. An ability to apply knowledge of mathematics, science, and engineering. An ability to function on multidisciplinary teams. An ability to identify, formulate, and solve engineering problems. An ability to communicate effectively. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Rules & Requirements
Prerequisites: Chem 1A, Physics 7B, Physics 7C, Engineering 45. BIO 1A and Chem 1B preferred

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: Lin

Introduction to Nanotechnology and Nanoscience: Read Less [-]

MEC ENG C218 Introduction to MEMS Design 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
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 219 Introduction to Microelectromechanical Systems 3 Units
Terms offered: Fall 2021, Fall 2020, Spring 2001
Fundamentals of microelectromechanical systems including design, fabrication of microstructures; surface micromachining, bulk-micromachining, LIGA, and other micro machining processes; fabrication principles of integrated circuit device and their applications for making MEMS devices; high-aspect-ratio microstructures; scaling issues in the micro scale (heat transfer, fluid mechanics and solid mechanics); device design, analysis, and mask layout.
Introduction to Microelectromechanical Systems: Read More [+]

Objectives & Outcomes
Course Objectives: The course aims to provide basic understanding of micromachining processes, including surface micromachining, bulk micromachining and LIGA. Students should learn the design and fabrication aspects of MEMS by using computer-aided-design tools to design and draw their own microstructures.
Student Learning Outcomes: ABET: A recognition of the need for, and an ability to engage in life-long learning; a knowledge of contemporary issues; an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
ABET: An ability to apply knowledge of mathematics, science, and engineering; an ability to design a system, component, or process to meet desired needs; an ability to identify, formulate, and solve engineering problems.
Students completing this course will have: The ability to identify, formulate, and solve problems relating to MEMS manufacturing.
Students should be able to design micro-machining process flows by using fundamental skills learned in the class and combine with knowledge from other courses to construct their own micro-machines.
The ability to apply mathematics, basic science, and engineering science to the solution of MEMS manufacturing problems.
The ability to design a component and select a fabrication process or sequence of processes suitable for production of a MEMS device.
The ability to identify, formulate, and solve problems relating to MEMS manufacturing.
The ability to interpret the results of engineering investigations.

Rules & Requirements
Prerequisites: MEC ENG 100 and PHYSICS 7B
Credit Restrictions: Students will receive no credit for MEC ENG 219 after completing MEC ENG 219, or MEC ENG 219. A deficient grade in MEC ENG 219 may be removed by taking MEC ENG 219, or MEC ENG 219.

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: Lin

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

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. Compositional stability 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

MEC ENG 221 Graduate Introduction to Lean Manufacturing Systems 3 Units
Terms offered: Spring 2021, Spring 2019, Spring 2018
Fundamentals of lean manufacturing systems including manufacturing fundamentals, unit operations and manufacturing line considerations for work in process (WIP), manufacturing lead time (MLT), economics, quality monitoring; high mix/low volume (HMLV) systems fundamentals including just in time (JIT), kanban, buffers and line balancing; class project/case studies for design and analysis of competitive manufacturing systems.

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
MEC ENG C223 Polymer Engineering 3 Units
Terms offered: Fall 2021, Fall 2019, Fall 2017
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.

Polymer Engineering: Read More [+]

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

MEC ENG 224 Mechanical Behavior of Engineering Materials 3 Units
Terms offered: Spring 2020, Fall 2018, Fall 2016
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.

Mechanical Behavior of Engineering Materials: Read More [+]

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.

MEC ENG 224A Failure Analysis of Structural Material 3 Units
Terms offered: Spring 2022
This course covers the fundamental materials science, mechanical behavior and failure modes of structural materials. Case studies of failure analysis involving materials, designs and ethical considerations are presented. The course utilizes three team-based projects. All course content is accessible in B-courses.

Failure Analysis of Structural Material: Read More [+]

Rules & Requirements

Prerequisites: MECENG 108 or equivalent

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: Pruitt

Failure Analysis of Structural Material: Read Less [-]

MEC ENG C225 Deformation and Fracture of Engineering Materials 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
This course covers deformation and fracture behavior of engineering materials for both monotonic and cyclic loading conditions.

Deformation and Fracture of Engineering Materials: Read More [+]

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: Fall 2021, Spring 2019, Fall 2016
Surface interactions. Fundamentals of contact mechanics. Friction
theories. Types of measurement of wear. Response of materials
to surface tractions. Plastic deformation, void/crack nucleation and
crack propagation. Delamination wear. Microstructural effects in wear
processes. Mechanics of layered media. Solid film and boundary liquid
film lubrication. Friction and wear of polymers and fiber-reinforced
polymeric composites. Brief introduction to metal cutting and tool wear
mechanisms.
Tribology: Read More [+]
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 226L The Science and Engineering
of Cooking 4 Units
Terms offered: Spring 2022
This course will discuss concepts from the physical sciences and
engineering (e.g. heat and mass transfer, phase transitions, fluid
mechanics, etc.) that serve as a foundation for everyday cooking and
haute cuisine. The course will integrate the expertise of visiting chefs
from the Bay Area (and beyond) who will serve as guest lecturers and
present their cooking techniques. These unique opportunities will be
complemented by lectures that investigate in-depth the science and
engineering that underlie these techniques.
The Science and Engineering of Cooking: Read More [+]
Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture, 1 hour of discussion,
and 2 hours of laboratory per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Sohn
The Science and Engineering of Cooking: Read Less [-]

MEC ENG 227 Mechanical Behavior of
Composite Materials 3 Units
Terms offered: Spring 2022, Spring 2021, Spring 2013
Response of composite materials (fiber and particulate-reinforced
materials) to static, cyclic, creep and thermomechanical loading.
Manufacturing process-induced variability, and residual stresses. Fatigue
behavior, fracture mechanics and damage development. Role of the
reinforcement-matrix interface in mechanical behavior. Environmental
effects. Dimensional stability and thermal fatigue. Application to polymer,
metal, ceramic, and carbon matrix composites.
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 2020, Spring 2019, Spring 2018
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.
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.

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.

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 2021, Fall 2020, Fall 2019
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 2022, Spring 2021, Fall 2020, Spring 2020
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 2021, Fall 2020, Fall 2019

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 2022, Spring 2021, Spring 2020
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 and 1 hour of discussion per week
Additional Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: Tomizuka, Horowitz
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: Packard, Poolla
Multivariable Control System Design: Read Less [-]

MEC ENG 235 Design of Microprocessor-Based Mechanical Systems 4 Units
Terms offered: Spring 2022, Fall 2020, Spring 2020
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 236C Vehicle Dynamics & Control 4 Units
Terms offered: Spring 2021
Physical understanding of automotive vehicle dynamics: simple lateral, longitudinal and ride quality models. An overview of active safety systems will be intros including basic concepts and terminology, the state-of-the-art development, and basic principles of systems such as ABS, traction control, dynamic stability control, and roll stability control. Passive, semi-active and active suspension systems will be analyzed. Concepts of autonomous vehicle technology including drive-by-wire and steer-by-wire systems, adaptive cruise control and lane keeping systems. Design of software control systems for an actual 1/10 scale race vehicle.
Vehicle Dynamics & Control: Read More [+]

Objectives & Outcomes
Course Objectives: Develop skills in using professional computer-aided control system design and analysis tools, e.g., Matlab/Simulink and ROS, to explore properties of dynamic systems composed of a large number of sub-systems such as sensors and actuators.
Develop the analytical skills necessary to quantitatively predict the behavior of open-loop and closed-loop systems.
Experimental design will be complemented with a careful analysis of the performance by simulation.
Feedback control systems will be presented that are currently being used in active safety systems; the student will be expected to design feedback control systems for an actual 1/10 scaled vehicle platform which will be distributed to every group of two students in the class.
Present and motivate the appropriate level of dynamic modeling that is required to analyze the performance of vehicle control systems.
The development of such models is as much of an art as a science in that the models must be kept as simple as possible so that real-time controller implementation can be achieved while retaining the fundamental stability and dynamic response characteristics.

Student Learning Outcomes: 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.

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.
Follow the literature on these subjects and perform independent design, research and development work in this field
Formulate simple but accurate dynamic models for automotive longitudinal, lateral and ride quality analysis.
Have a basic understanding of modern automotive safety systems including ABS, traction control, dynamic stability control and roll control.
Students should be able to follow the literature on these subjects, perform independent design, be able to design vehicle dynamics control systems for a 1/10 scale vehicle.

Rules & Requirements
Prerequisites: Math 1B, Math 53, 54, Physics 7A-7B, ENGIN 7, Mechanical Engineering 132 or Mechanical Engineering 231A for MECENG graduate students

Credit Restrictions: Students will receive no credit for MEC ENG 236C after completing MEC ENG 131. A deficient grade in MEC ENG 236C may be removed by taking MEC ENG 131.

Hours & Format
Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of laboratory per week
MEC ENG 236U Control and Dynamics of Unmanned Aerial Vehicles 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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
Control of Nonlinear Dynamic Systems: Read More [+]

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.

MEC ENG C237 Nonlinear Systems 3 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
Nonlinear Systems: Read More [+]

Rules & Requirements
Prerequisites: MATH 54 (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.
Advanced 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/Graduate
Grading: Letter grade.
Advanced Micro/Nano Mechanical Systems Laboratory: Read Less [-]
MEC ENG 239 Robotic Locomotion 4 Units
Terms offered: Fall 2021, Fall 2019, Fall 2018
This course will provide students with a solid understanding of robotic locomotion and the use of dynamics, control and embedded microcomputers in designing artificial legs such as prosthetics, orthotics and exoskeletons.

Objectives & Outcomes

Course Objectives: 1. The course objectives are to train students to be able to design artificial legs, select and design components of the robotic legs.
2. Conduct various analyses on the legs’ performance, propose and study practical applications such as orthotics and prosthetics in medical field, back support, knee support and shoulder support exoskeletons in industrial field and recreational exoskeletons.

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

Rules & Requirements

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

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

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

Robotic Locomotion: Read More [+]

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

Advanced Marine Structures I: Read Less [-]

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

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 More [+]

MEC ENG 241B Marine Hydrodynamics II 3 Units
Terms offered: Spring 2017, Spring 2016, Fall 2014

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 242 Ocean-Environment Fluid Mechanics 3 Units
Terms offered: Spring 2020

Objectives & Outcomes
Course Objectives: To provide training of mechanical engineers to understand the unique characteristics of the ocean environment, local and global scale, and to provide background on engineering and design tools that are commonly used by engineers working with system and component designs of ocean, marine energy, and ship systems.

Student Learning Outcomes: At the end of the course, the students should understand general scientific properties that characterize the main body of the oceans; understand components of drags that contribute to the resistance of a marine vehicle and the associated engineering skills in model-testing that quantify the drag characteristics of a ship hull; comprehend simple harmonic surface-wave theory, with strong realization of the underlying concepts of wave kinematics, wave energy, and group velocity.

Rules & Requirements
Prerequisites: ME 106 OR CEE 100 OR equivalent fluids/hydro undergraduate class

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

Advanced Details
Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructor: Mäkiharju

Ocean-Environment Fluid Mechanics: Read More [+]

MEC ENG 243 Advanced Methods in Free-Surface Flows 3 Units
Terms offered: Spring 2016, Fall 2012, Spring 2009

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

Advanced 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 2021, Spring 2018, Spring 2016
 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 248 Experimental Methods in Single-and Multiphase Flows 3 Units
Terms offered: Fall 2021, Fall 2000, Fall 1999
Fundamentals of modern single & multiphase flow measurement techniques, w. intrusive and non-intrusive techniques. Students will learn the fundamentals of particle image velocimetry, electrical impedance measurements, X-ray based multiphase flow measurements, and advanced measurement data processing and analysis techniques. Different demos are conducted, students will work in teams in their labs, on both simple experiments, and on one major experiment design. The course provides understanding of modern measurement techniques used to generate validation and verification data numerical models, and as such is expected to benefit the modelers as well. Relevant to mechanical, ocean, nuclear, civil, & numerical modeling grad.

Objectives & Outcomes

Course Objectives: Students will gain hand-on experience on several techniques, and become familiar (through theory and practice) with the strengths and limitations of various techniques. The students will be trained in good experimental practices, introduced to modern techniques and approaches to data analysis.

Student Learning Outcomes: By the end of the course the students will be prepared to conduct leading edge experimental research work from design of the experiment through data analysis. They will understand the fundamental principles of numerous measurement techniques, especially those relevant to fluids measurements. This course will prepare students for graduate level experimental work, or its management, in academic or industrial labs.

Rules & Requirements

Prerequisites: Mechanical Engineering 103 or similar undergraduate introductory measurements class

Credit Restrictions: Students will receive no credit for MEC ENG 248 after completing MEC ENG 248. A deficient grade in MEC ENG 248 may be removed by taking MEC ENG 248.

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate

Grading: Letter grade.

Instructor: Mäkiharju

Experimental Methods in Single-and Multiphase Flows: Read More [+]

MEC ENG 249 Machine Learning Tools for Modeling Energy Transport and Conversion Processes 3 Units
Terms offered: Fall 2021, Spring 2021
This course teaches students how machine learning tools work and their effective use in energy related research and technology development. This course first covers basic probability, linear algebra concepts, and foundation mathematics principles used in machine learning tools. Python programming will be used in class projects. Students will construct a genetic algorithm and a neural network model from scratch to explore basic features of these tools, and will then use Python neural network programming tools to develop models for energy conversion and energy transport process applications. Students will explore different machine learning methods in 3 assigned projects and can construct a final project in an application of interest to them.

Objectives & Outcomes

Course Objectives: Students will gain hand-on experience on several techniques, and become familiar (through theory and practice) with the strengths and limitations of various techniques. The students will be trained in good experimental practices, introduced to modern techniques and approaches to data analysis.

Student Learning Outcomes: By the end of the course the students will be prepared to conduct leading edge experimental research work from design of the experiment through data analysis. They will understand the fundamental principles of numerous measurement techniques, especially those relevant to fluids measurements. This course will prepare students for graduate level experimental work, or its management, in academic or industrial labs.

Rules & Requirements

Prerequisites: Undergraduate courses in multivariable calculus and linear algebra Math 53 and Math 54 or equivalent), an undergraduate course in thermodynamics (MECENG 40, ENGIN 115 or equivalent), and an undergraduate course in computer programming (ENGIN 7 or COMPSCI 61A 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: Van Carey

Machine Learning Tools for Modeling Energy Transport and Conversion Processes: Read More [+]

Experimental Methods in Single-and Multiphase Flows: Read Less [-]
MEC ENG 250A Advanced Conductive and Radiative Transport 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019

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 2020, Spring 2019
The transport of heat and mass in fluids in motion; free and forced convection in laminar and turbulent flow over surfaces and within ducts. Fundamentals of computational methods used for solving the governing transport equations will also be covered.

Objectives & Outcomes

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

Student Learning Outcomes: 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.

Heat Conduction: 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 Convection: Read Less [-]

MEC ENG 253 Graduate Applied Optics and Radiation 3 Units
Terms offered: Spring 2018, Fall 2015, Fall 2013
Graduate Applied Optics and Radiation: Read More [+]

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

Student Learning Outcomes: Students will gain knowledge of the EM theory, optical properties of materials, principles of spectroscopy for gases, liquids and solids, principles and applications of lasers and optical diagnostics. Students will develop the ability to design optical instrumentation systems in the context of key industrial applications, including additive manufacturing, materials processing, bio-optics, semiconductor industry applications, reacting systems, forensics.

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

Credit Restrictions: Students will not receive credit for this course if they have taken ME 153.

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

Graduate Applied Optics and Radiation: Read Less [-]
MEC ENG 254 Advanced Thermophysics for Applications 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 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.
Advanced 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: 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
Advanced Thermophysics for Applications: Read Less [-]

MEC ENG 255 Advanced Combustion Processes 3 Units
Terms offered: Fall 2020, Fall 2019, Fall 2018
Fundamentals of combustion, flame structure, flame speed, flammability, ignition, stirred reaction, kinetics and nonequilibrium processes, pollutant formation. Application to engines, energy production, and fire safety.
Advanced Combustion Processes: Read More [+]
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: 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: Spring 2022, Fall 2018, Spring 2016
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 2020, Fall 2017, Spring 2016
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 2021, Fall 2020, Fall 2019
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 2022, Spring 2020, Spring 2019
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 and 1 hour of discussion 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 2021, Fall 2018, Fall 2014
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 263Z ENGINEERING AERODYNAMICS 3 Units
Terms offered: Fall 2021, Spring 2021
Introduction to the lift, drag, and moment of two-dimensional airfoils, three-dimensional wings, and the complete airplane. Calculations of the performance and stability of airplanes in subsonic flight. The course is run on two loosely aligned parallel tracks: a traditional sequence of lectures covering the basic topics in aerodynamics and a set of projects on vortex dynamics and aerodynamics that are loosely aligned with lectures. The distinguishing factor will be the extend of the projects assigned to the graduate level participants, which will be substantially more involved than those expected from the senior level participants.

RULES & REQUIREMENTS
Prerequisites: ME 40, ME 106
Credit Restrictions: Students will receive no credit for MEC ENG 263Z after completing MEC ENG 163. A deficient grade in MEC ENG 263Z may be removed by taking MEC ENG 163.

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

ENGINEERING AERODYNAMICS: Read Less [-]

MEC ENG 266 Geophysical and Astrophysical Fluid Dynamics 3 Units
Terms offered: Spring 2022, Spring 2019, Spring 2015
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 studies 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.

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 270 Advanced Augmentation of Human Dexterity 4 Units
Terms offered: Spring 2021, Spring 2020
This course provides hands-on experience in designing prostheses and assistive technologies using user-centered design. Students will develop a fundamental understanding of the state-of-the-art, design processes and product realization. Teams will prototype a novel solution to a disabilities-related challenge, focusing on upper-limb mobility or dexterity. Lessons will cover biomechanics of human manipulation, tactile sensing and haptics, actuation and mechanism robustness, and control interfaces. Readings will be selected from texts and academic journals available through the UCB online library system and course notes. Guest speakers will be invited to address cutting edge breakthroughs relevant to assistive technology and design.

Objectives & Outcomes

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

Rules & Requirements

Prerequisites: ME 132, or equivalent. Designing for the Human Body (ME C178) or Orthopedic Biomechanics (ME C176), or equivalent. Proficiency with Matlab, or equivalent program

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

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: Stuart

Intermediate Dynamics: Read More [+]

MEC ENG 271 Intermediate Dynamics 3 Units
Terms offered: Spring 2022, Fall 2021, Fall 2020
This course introduces and investigates Lagrange's equations of motion for particles and rigid bodies. The subject matter is particularly relevant to applications comprised of interconnected and constrained discrete mechanical components. The material is illustrated with numerous examples. These range from one-dimensional motion of a single particle to three-dimensional motions of rigid bodies and systems of rigid bodies.

Objectives & Outcomes

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

Rules & Requirements

Prerequisites: ME 104 or equivalent

Credit Restrictions: Students will receive no credit for MEC ENG 271 after completing MEC ENG 175, or MEC ENG 271. A deficient grade in MEC ENG 271 may be removed by taking MEC ENG 271.

Hours & Format

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

Additional Details

Subject/Course Level: Mechanical Engineering/Graduate
Grading: Letter grade.
Instructors: O'Reilly, Casey

Intermediate Dynamics: Read Less [-]
MEC ENG 272 Wildland Fires: Science and Applications 3 Units
Terms offered: Spring 2022
This course presents an introduction to the global problem of wildland fires with an overview of the social, political and environmental issues posed as well as detailed coverage of the science, technology and applications used to predict, prevent and suppress wildland fires. Some specific topics covered will include fire spread theory, risk mapping, research instrumentation, suppression, ignition sources, relevant codes and standards, remote sensing, smoke management, and extreme fire behavior. Engineering analyses in many of these areas, as well as specific coverage of fire protection design in the Wildland-Urban Interface (WUI) will also be covered.
Wildland Fires: Science and Applications: Read More [+]
Objectives & Outcomes
Course Objectives: The course objectives are to provide students with the knowledge necessary to work within the highly interdisciplinary field of wildland fire, including a broad understanding of the social, ecological, and economic factors influencing wildland fire, a firm understanding of the underlying mechanisms affecting wildland fire processes, and an ability to apply the tools necessary to predict the spread rate and intensity of wildland fires and assess protection of WUI communities.
Student Learning Outcomes: (a) An ability to apply knowledge of mathematics, science, and engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Rules & Requirements
Prerequisites: MEC ENG 109 or equivalent course in heat transfer (concurrent enrollment allowed)

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

MEC ENG 273 Oscillations in Linear Systems 3 Units
Terms offered: Spring 2022, Spring 2021, Fall 2018
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.

MEC ENG C278 Adv Designing for the Human Body 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
The course provides project-based learning experience in understanding product design, with a focus on the human body as a mechanical machine. Students will learn the design of external devices used to aid or protect the body. Topics will include forces acting on internal materials (e.g., muscles and total replacement devices), forces acting on external materials (e.g., protheses 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.

MEC ENG 277 Nonlinear and Random Vibrations 3 Units
Terms offered: Spring 2021, Spring 2016, Spring 2014

MEC ENG 278 Adv Designing for the Human Body 4 Units
Terms offered: Fall 2019, Fall 2018, Fall 2017
The course provides project-based learning experience in understanding product design, with a focus on the human body as a mechanical machine. Students will learn the design of external devices used to aid or protect the body. Topics will include forces acting on internal materials (e.g., muscles and total replacement devices), forces acting on external materials (e.g., protheses 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.

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.
MEC ENG C279 Introduction to Statistical Mechanics for Engineers 3 Units
Terms offered: Spring 2020, Spring 2017, Fall 2013
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 2021, Fall 2020, Fall 2019
Introduction to the Finite Element Method: Read More [+]
Rules & Requirements
Prerequisites: Mathematics 50A-50B; some familiarity with elementary field theories of solid/liquid 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 2022, Spring 2019, Spring 2016
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 2021, Fall 2017, Fall 2015
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 2022, Spring 2020, Spring 2018
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: Bogy
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 2020, Spring 2018, Spring 2016
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.

Engineering Rheology: Read More [+]

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.

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

MEC ENG 285E 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.

Mechanics and Physics of Lipid Bilayers: Read More [+]

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

Mechanics and Physics of Lipid Bilayers: Read Less [-]

MEC ENG 286 Theory of Plasticity 3 Units
Terms offered: Fall 2020, Fall 2018, Spring 2015
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.

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 2021, Fall 2020, Fall 2019
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: 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.

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: Casey, Johnson, Papadopoulos, Steigmann

MEC ENG 288 Theory of Elastic Stability 3 Units
Terms offered: Spring 2009, Fall 2007, Fall 1999

Rules & Requirements

Prerequisites: 185 and 273

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

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.

Rules & Requirements

Prerequisites: 185 and 281

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: Johnson, Steigmann

Theory of Shells: Read More [+]
MEC ENG 290C Topics in Fluid Mechanics 3 Units
Terms offered: Spring 2020, Spring 2015, Fall 2010
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: Spring 2022, Fall 2018, Fall 2016
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 2021, Spring 2018, Fall 2015
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 More [+]
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 More [+]
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.

Sustainable Manufacturing: Read More [+]

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.

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: Dornfeld

Sustainable Manufacturing: Read Less [-]

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.

Predictive Control for Linear and Hybrid Systems: Read More [+]

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.

Rules & Requirements

Prerequisites: ME C232 and ME C231A

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

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
Hours & Format
Fall and/or spring: 8 weeks - 4 hours of lecture per week

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

Innovation through Design Thinking: Read Less [-]

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
Hours & Format
Fall and/or spring: 8 weeks - 2 hours of lecture per week

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

Life Cycle Thinking in Engineering Design: Read Less [-]
**MEC ENG 290L Introduction to Nano-Biology**

3 Units  
Terms offered: Fall 2020, Fall 2018, Spring 2017  
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 [-]

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**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 [-]

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**MEC ENG 290N System Identification**

3 Units  
Terms offered: Spring 2020, Fall 2010, Fall 2008  
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.

### Objectives & Outcomes
**Course Objectives:** Students can expect to depart the semester understanding new product development processes as well as useful tools, techniques and organizational structures that support new product development practice.

**Student Learning Outcomes:** Students can expect to depart the semester understanding new product development processes as well as useful tools, techniques and organizational structures that support new product development practice in the context of the “triple bottom line” – economy, environment and society.

### Rules & Requirements
**Prerequisites:** Graduate standing, consent of instructor

### Hours & Format
**Fall and/or spring:** 15 weeks - 3-3 hours of lecture and 0-1 hours of voluntary per week

### Additional Details
**Subject/Course Level:** Mechanical Engineering/Graduate

**Grading:** Letter grade.

**Instructor:** Agogino

New Product Development: Design Theory and Methods: Read More [+]

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

### Dynamic Control of Robotic Manipulators:

**Rules & Requirements**

**Prerequisites:** 230, 232, or consent of instructor

**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.

**Instructors:** Horowitz, Kazerooni

Dynamic Control of Robotic Manipulators: Read Less [-]

**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.

### Topics in Manufacturing:

**Rules & Requirements**

**Prerequisites:** 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.

**Instructors:** Dornfeld, McMains, Wright

Topics in Manufacturing: Read Less [-]
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.
Plasmonic Materials: Read More [+]

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
Plasmonic Materials: Read Less [-]

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.
Interactive Device Design: Read More [+]

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
Interactive Device Design: Read Less [-]

MEC ENG 290V 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.
Topics in Energy, Climate, and Sustainability: Read More [+]

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.

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/Graduate
Grading: Offered for satisfactory/unsatisfactory grade only.
Instructors: Wright, Burns, Cullenward
Topics in Energy, Climate, and Sustainability: Read Less [-]
MEC ENG C290S Hybrid Systems and Intelligent Control 3 Units
Terms offered: Spring 2021, Spring 2020, Spring 2018

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: Offered for satisfactory/unsatisfactory grade only.
Instructors: Keaveny, Pruitt
Also listed as: BIO ENG C290D

Advanced Technical Communication: Proposals, Patents, and Presentations: Read Less [-]

MEC ENG 292A Advanced Special Topics in Bioengineering 1 - 4 Units
Terms offered: Fall 2020, Spring 2020, Spring 2018
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
Grading: Letter grade.
Instructor: Faculty

Advanced Special Topics in Bioengineering: Read Less [-]

MEC ENG 292B Advanced Special Topics in Controls 1 - 4 Units
Terms offered: Spring 2022, Fall 2020, Fall 2019
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: Fall 2021, Spring 2021, Fall 2020
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.

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 More [+]

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.

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: Fall 2019, Spring 2019, Spring 2018
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.

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: Fall 2020, 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 2022, Fall 2021, Spring 2021
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.
Engineering Field Studies: Read Less [-]

MEC ENG 298 Group Studies, Seminars, or Group Research 1 - 8 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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 2022, Fall 2021, Spring 2021
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 2022, Fall 2021, Spring 2021
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

UGBA C5 Introduction to Entrepreneurship 2 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019, Fall 2018
This course offers students a taste of what it's really like to start a business. In addition to learning key foundational entrepreneurial concepts such as idea generation & evaluation, customer & product development, creating a business model, fundraising, marketing, and scaling & exiting a business, students will also hear from successful entrepreneurs who share their perspectives and best practices. Students will apply core concepts by working in teams to evaluate and select a venture idea that they will then develop throughout the semester.
Introduction to 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.
Also listed as: L & S C5
Introduction to Entrepreneurship: Read Less [-]

UGBA 10 Principles of Business 3 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
This team-taught course provides an introduction to the study of the modern business enterprise. It consists of four modules, the order of which may vary from semester to semester, and an online business simulation that runs during most of the semester. The four modules cover: Finance & Accounting, Marketing, Operations & Sustainability, and Leadership. In addition to lectures and the simulation, students attend discussion section each week.
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. Alternative to final exam.
Formerly known as: Business Administration 10
Principles of Business: Read Less [-]

UGBA C12 The Berkeley Changemaker 2 Units
Terms offered: Spring 2022, Summer 2021 Second 6 Week Session, Spring 2021
Berkeley Changemaker impact occurs across many fronts: scientific, artistic, social, and entrepreneurial. This course helps students identify as a Berkeley Changemaker and learn the critical thinking, communication, and collaboration skills to become one. Combining disciplines across UC Berkeley, the course also helps launch the Berkeley Discovery arc. Students develop their own leadership styles and discover how they can create and lead diverse teams to act upon the world. Values in Berkeley’s DNA like Questioning the Status Quo and going Beyond Yourself support students in leading from whatever position they occupy, preparing them to leave their mark on campus, in their communities, or beyond. More at: http://changemaker.berkeley.edu.
The Berkeley Changemaker: Read More [+]

Hours & Format
Fall and/or spring: 8 weeks - 4 hours of web-based lecture per week
Summer:
3 weeks - 10 hours of web-based lecture per week
6 weeks - 5 hours of web-based lecture per week
8 weeks - 4 hours of web-based 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.
Also listed as: L & S C12
The Berkeley Changemaker: Read Less [-]
UGBA 24 Freshman Seminars 1 Unit
Terms offered: Spring 2022, Spring 2021, Spring 2020
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: The grading option will be decided by the
instructor when the class is offered. Final exam required.

Freshman Seminars: Read Less [-]

UGBA 39AC Philanthropy: A Cross-Cultural
Perspective 3 Units
Terms offered: Fall 2021, Fall 2019, Fall 2018
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 39

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

UGBA 39E Freshman/Sophomore Seminar 2 -
4 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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 88 Data and Decisions 2 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021

The goal of this connector course is to provide an understanding of how data and statistical analysis can improve managerial decision-making. We will explore statistical methods for gleaning insights from economic and social data, with an emphasis on approaches to identifying causal relationships. We will discuss how to design and analyze randomized experiments and introduce econometric methods for estimating causal effects in non-experimental data. The course draws on a variety of business and social science applications, including advertising, management, online marketplaces, labor markets, and education. This course, in combination with the Data 8 Foundations course, satisfies the statistics prerequisite for admission to Haas.

Data and Decisions: Read More [+]

Rules & Requirements

Prerequisites: One semester of Calculus (Math 16A or Math 1A).
Also, this is a Data Science connector course and may only be taken concurrently with or after completing Computer Science C8/Statistics C8/Information C8

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 required.

Instructor: Miller

Data and Decisions: Read Less [-]

UGBA C95B Introduction to the Biotechnology Field and Industry 2 Units
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: 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

Formerly known as: Molecular and Cell Biology C95B/Undergrad. Business Administration C95B

Also listed as: MCELLBI C75

Introduction to the Biotechnology Field and Industry: Read Less [-]

UGBA 96 Lower Division Special Topics in Business Administration 1 - 4 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019

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 - 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.

Lower Division Special Topics in Business Administration: Read Less [-]
UGBA 98 Directed Group Study 1 - 4 Units
Terms offered: Spring 2015, Fall 2014, Spring 2014
Organized group study on topics selected by lower division students under the sponsorship and direction of a member of the Haas School of Business faculty.

Directed Group Study: Read More [+]

Rules & Requirements
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 - 1-4 hours of directed group 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 98

Directed Group Study: Read Less [-]

UGBA 100 Business Communication 2 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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
Prerequisites: Restricted to Undergraduate Business Administration Majors Only

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
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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 W21, or equivalents
Credit Restrictions: Students will receive no credit for UGBA 101A after completing ECON 100A, ECON 101A, BUS ADM 110, ENVECON 100, BUS ADM S110, IAS 106, or POLECON 106. A deficient grade in UGBA 101A may be removed by taking POLECON 106, ECON 100A, ECON 101A, ENVECON 100, IAS 106, or POLECON 106.

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
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
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.

Rules & Requirements
Prerequisites: Economics 1, Mathematics 1A or 16A, Statistics W21, or equivalents
Credit Restrictions: Students will receive no credit for UGBA 101B after completing ECON 100B, ECON 101B, BUS ADM 111, IAS 107, or POLECON 107. A deficient grade in UGBA 101B may be removed by taking ECON 100B, ECON 101B, IAS 107, or POLECON 107.

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, with common exam group.
Formerly known as: Business Administration 111
Macroeconomic Analysis for Business Decisions: Read Less [-]

UGBA 102A Financial Accounting 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 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.

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.
Financial Accounting: Read Less [-]

UGBA 102B Managerial Accounting 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
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.

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 W102A Financial Accounting 3 Units**
Terms offered: Summer 2021 First 6 Week Session, Summer 2020 First 6 Week Session, Summer 2019 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.

**UGBA 103 Introduction to Finance 4 Units**
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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

**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 104 Introduction to Business Analytics 3 Units**
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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 W21, 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
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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 - 1.5-3 hours of lecture and 1.5-0 hours of discussion per week
Summer:
6 weeks - 4-8 hours of lecture and 4-0 hours of discussion per week
8 weeks - 3-6 hours of lecture and 3-0 hours of discussion per week

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

UGBA 106 Marketing 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
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
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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 117 Special Topics in Economic Analysis and Policy 1 - 4 Units
Terms offered: Fall 2018, Spring 2018, Fall 2017
A variety of topics in economic analysis and policy with emphasis on current problems and research.
Formerly known as: Business Administration 119

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
Terms offered: Fall 2021, Spring 2021, Fall 2019
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.

Intermediate Financial Accounting 1: Read Less [-]

UGBA 120AA Intermediate Financial Accounting 1 4 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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
Terms offered: Spring 2022, Fall 2021, Spring 2021
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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 
Terms offered: Fall 2021, Fall 2020, Fall 2019
This course examines how accounting in the financial services industry – banking, insurance, investment industry, and 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.

Rules & Requirements
Prerequisites: Students are encouraged to complete UGBA 102A or to possess a basic understanding about how financial statements are prepared

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 125 Ethics in Accounting 3 Units  
Terms offered: Fall 2021, Fall 2020, Spring 2020
This course focuses on ethics related to the accounting for and reporting of financial statements and related financial information, and touches on the ethics of tax preparers. It is taught within the context of the American Institute of Certified Public Accountants (AICPA), as well as broader ethical concepts. This course fulfills the accounting ethics education requirement of the California Board of Accountancy, needed for a California CPA license. The course covers (i) theories and rules and (ii) the application of these theories and rules to case studies drawn from real life. Students are taught not only to identify the risks of fraud, but also how an organization's culture and structure might be altered to reduce the risks.

Ethics in Accounting: Read More [+]

Rules & Requirements

Prerequisites: 120AA (120AB and 120B recommended)

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

UGBA 126 Auditing 4 Units 
Terms offered: Spring 2022, Fall 2021, Spring 2021
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.
UGBA 127 Special Topics in Accounting 1 - 4 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
A variety of topics in accounting with emphasis on current problems and research.
Special Topics in Accounting: Read More [+]

Rules & Requirements
Prerequisites: At the discretion of the instructor
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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 131 Corporate Finance and Financial Statement Analysis 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session
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
Terms offered: Spring 2022, Spring 2020, 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.
Corporate Strategy and Valuation: Read More [+]

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.
Corporate Strategy and Valuation: Read Less [-]
UGBA 132 Financial Institutions and Markets
3 Units
Terms offered: Summer 2020 First 6 Week Session, Summer 2019 First 6 Week Session, Summer 2018 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.
Financial Institutions and Markets: Read More [+]
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
Terms offered: Fall 2021, Summer 2021 First 6 Week Session, Summer 2021 Second 6 Week Session
Sources of and demand for investment capital, operations of security markets, determination of investment policy, and procedures for analysis of securities.
Investments: Read More [+]
Rules & Requirements
Prerequisites: 103

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.
Instructors: Odean, Selinger
Investments: Read Less [-]

UGBA 134 Introduction to Financial Engineering 3 Units
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.
Introduction to Financial Engineering: Read More [+]
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.

UGBA 135 Personal Financial Management 2 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
Survey of major life financial decisions (e.g., career choice, consumption versus saving, investments, mortgages, insurance) and how decision-making biases (e.g., overconfidence, present bias, limited attention) can lead to suboptimal choice. The course draws on research from economics, psychology, and sociology.
Personal Financial Management: 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 required.
Instructors: Odean, Selinger
Personal Financial Management: Read Less [-]
**UGBA 136F Behavioral Finance 3 Units**

Terms offered: Summer 2021 Second 6 Week Session, Summer 2020 Second 6 Week Session, Summer 2019 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

**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.

Behavioral Finance: Read Less [-]

**UGBA 137 Special Topics in Finance 1 - 4 Units**

Terms offered: Spring 2022, Fall 2021, Summer 2021 Second 6 Week Session

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.

**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 139

Special Topics in Finance: Read Less [-]

**UGBA 141 Production and Operations Management 2 - 3 Units**

Terms offered: Spring 2022, Spring 2021, Spring 2017

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

**Hours & Format**

Fall and/or spring: 15 weeks - 2-3 hours of lecture and 0-1 hours of discussion per week

Summer: 6 weeks - 5-7.5 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.

Formerly known as: Business Administration 142

Production and Operations Management: Read Less [-]

**UGBA 143 Game Theory and Business Decisions 3 Units**

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

**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.

Formerly known as: Business Administration 139

Game Theory and Business Decisions: Read Less [-]
**UGBA 146 Project Management 2 Units**
Terms offered: Summer 2021 First 6 Week Session, Summer 2020 First 6 Week Session, Fall 2005
The primary objective of this course is to develop the critical skills and knowledge needed to successfully pitch and lead projects, and to deliver those projects on time and within budget. The course delves into formal planning and scheduling techniques including: project definition, project selection, Work Breakdown Structure (WBS), Resource Estimation, Critical Path Method (CPM), Pert, Gantt Charts, Resource Constrained Scheduling, Project Monitoring and Project Closing.
Project Management: Read More [+]

**Hours & Format**
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.

**UGBA 147 Special Topics in Operations and Information Technology Management 1 - 4 Units**
Terms offered: Spring 2022, Summer 2021 First 6 Week Session, Spring 2021
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 150 Leading High Impact Teams 3 Units**
Terms offered: Spring 2022
This course helps students hone and develop the leadership skills needed to lead dynamic, complex, global teams. Globalization, rapid technological change, and a shift towards an innovation-based economy have resulted in more dynamic, distributed, cross-functional, as well as demographically and culturally diverse teams. Students will learn to create team developmental plans and accountability, coach teams through challenges, encourage teams to recognize and avoid bias and misattributions, and lead from a distance and across boundaries.
Leading High Impact Teams: 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. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

**UGBA 151 Management of Human Resources 3 Units**
Terms offered: Spring 2022, Spring 2021, Spring 2020
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 151A People Analytics 2 Units
Terms offered: Not yet offered
This course focuses on measuring and analyzing the costs and benefits
of human capital investments by providing students with the ability to
develop, analyze and use information to assess and measure employee
and organizational performance. The course will show participants how
to develop and make critical recommendations on such information
to senior management, as well as helping to increase their presence
and credibility with key decision makers. On successful completion,
students will have the skills necessary to formulate both qualitative and
quantitative recommendations for key management decisions affecting
employees.

People Analytics: Read More [+]

Hours & Format
Fall and/or spring: 8 weeks - 4 hours of lecture per week

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

People Analytics: Read Less [-]

UGBA 152 Negotiation and Conflict Resolution 3 Units
Terms offered: Spring 2022, Fall 2021, Summer 2021 First 6 Week Session
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
Terms offered: Fall 2021, Summer 2021 Second 6 Week Session, Fall 2020
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.

Power and Politics in Organizations: Read Less [-]

UGBA 155 Leadership 3 Units
Terms offered: Summer 2021 First 6 Week Session, Fall 2020, Summer
2020 First 6 Week Session
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 [+]

Rules & Requirements
Credit Restrictions: Students will receive no credit for UGBA 155
after completing UGBA W155. A deficient grade in UGBA 155 may be
removed by taking UGBA W155.

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 C155 Leadership: Purpose, Authority, and Empowerment 3 Units
Terms offered: Summer 2021 10 Week Session, Summer 2020 10 Week Session
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: Purpose, Authority, and Empowerment: Read More [+]

Rules & Requirements
Credit Restrictions: Students will receive no credit for UGBA C155 after completing UGBA W155. A deficient grade in UGBA C155 may be removed by taking UGBA W155.

Hours & Format
Summer: 10 weeks - 4.5 hours of web-based lecture per week

Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Also listed as: UGIS C151

Leadership: Purpose, Authority, and Empowerment: Read Less [-]

UGBA W155 Leadership: Purpose, Authority, and Empowerment 3 Units
Terms offered: Prior to 2007
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: Purpose, Authority, and Empowerment: Read More [+]

Rules & Requirements
Credit Restrictions: Students will receive no credit for UGBA W155 after completing UGBA 155. A deficient grade in UGBA W155 may be removed by taking UGBA 155.

Hours & Format
Summer: 10 weeks - 4.5 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. Alternative to final exam.
Instructor: Mulhern

Leadership: Purpose, Authority, and Empowerment: Read Less [-]

UGBA 157 Special Topics in the Management of Organizations 1 - 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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 159 Becoming a Changemaker 2 Units
Terms offered: Spring 2022, Fall 2021
This course inspires, trains and equips participants to convert raw energy and enthusiasm for creating a better world into real leadership skills and mindsets which will empower you to create positive change at an individual, organizational and societal level. Anchored in change leadership and bringing together the fields of entrepreneurship, innovation, leadership & social impact, the course is focused on moving from ideas to action; gaining inspiration from diverse changemakers across roles and sectors; learning how to navigate, shape and lead change to thrive amidst uncertainty; and helping you become the kind of leader our companies, our communities and our world need right now.
Becoming a Changemaker: 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 required.
Becoming a Changemaker: Read Less [-]
UGBA 160 Customer Insights 3 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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.
Customer Insights: Read More [+]
Rules & Requirements
Prerequisites: 106

UGBA 161 Market Research: Tools and Techniques for Data Collection and Analysis 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2017
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

UGBA 162 Brand Management and Strategy 3 Units
Terms offered: Spring 2022, Fall 2020, Summer 2020 First 6 Week Session
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

UGBA 162A Product Branding and Branded Entertainment 2 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
As consumers demand information and products tailored specifically to their individual needs, brands strive to create alternative advertising methods to build lasting relationships and retain “top of mind” status. Smart consumers, especially those in niche markets, have dismissed traditional avenues of sponsorship and product placement. Course explores how and why brand executives across multiple industries are leveraging entertainment to connect with niche markets. It educates students about how marketers develop creative and entertaining ways to connect with multi-hyphenate customers. Course culminates in a Creative Pitch, based on a case study, and a Client Presentation where students present marketing campaigns to industry executives.
Product Branding and Branded Entertainment: Read More [+]
Rules & Requirements
Prerequisites: 106

UGBA 162B Product Branding and Branded Entertainment 2 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
As consumers demand information and products tailored specifically to their individual needs, brands strive to create alternative advertising methods to build lasting relationships and retain “top of mind” status. Smart consumers, especially those in niche markets, have dismissed traditional avenues of sponsorship and product placement. Course explores how and why brand executives across multiple industries are leveraging entertainment to connect with niche markets. It educates students about how marketers develop creative and entertaining ways to connect with multi-hyphenate customers. Course culminates in a Creative Pitch, based on a case study, and a Client Presentation where students present marketing campaigns to industry executives.
Product Branding and Branded Entertainment: Read More [+]
Rules & Requirements
Prerequisites: 106

UGBA 162C Product Branding and Branded Entertainment 2 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
As consumers demand information and products tailored specifically to their individual needs, brands strive to create alternative advertising methods to build lasting relationships and retain “top of mind” status. Smart consumers, especially those in niche markets, have dismissed traditional avenues of sponsorship and product placement. Course explores how and why brand executives across multiple industries are leveraging entertainment to connect with niche markets. It educates students about how marketers develop creative and entertaining ways to connect with multi-hyphenate customers. Course culminates in a Creative Pitch, based on a case study, and a Client Presentation where students present marketing campaigns to industry executives.
Product Branding and Branded Entertainment: Read More [+]
Rules & Requirements
Prerequisites: 106
UGBA 164 Marketing Strategy 3 Units
Terms offered: Spring 2020, Fall 2019, Spring 2019
This course specifically addresses how to deal with competition. Additionally, marketing managers usually have to make decisions with incomplete or unreliable information. In “Marketing Strategy” students learn how firms develop plans that can be updated in light of changing circumstances. The course covers the following topics: Market size estimation; Competitor identification and analysis; Internal analysis; Alternative business models; Risk identification, assessment and management using scenario planning; Handling unknown futures using sensitivity analysis; Price setting dynamics; Competitive tactics. The course utilizes a combination of lectures and cases. There are group presentations (self-selected teams) and some group projects.

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. Alternative to final exam.

Marketing Strategy: Read More [+]

UGBA 165 Advertising Strategy 3 Units
Terms offered: Summer 2021 First 6 Week Session, Summer 2020 First 6 Week Session, Fall 2019
Basic concepts and functions of advertising in the economy; consumer motivation; problems in utilizing advertising and measuring its effectiveness.

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.

Advertising Strategy: Read Less [-]

UGBA 167 Special Topics in Marketing 1 - 4 Units
Terms offered: Spring 2022, Spring 2020, Fall 2019
A variety of topics in marketing with emphasis on current problems and research.

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 169 Pricing 3 Units
Terms offered: Spring 2022, Spring 2021, Fall 2019
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.

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.

Pricing: Read Less [-]
UGBA 171 Tech and the City: How to Get Urban Innovation Right 3 Units
Terms offered: Spring 2022
This course critically examines how new technologies and business models impact cities, and identifies the approaches that produce not only the best business outcomes, but also the most equitable and sustainable outcomes. To begin, we explore what makes cities such compelling laboratories for technology innovation, learn from past attempts at “smart city” interventions, and discuss how technologists can identify more effective solutions to today’s urban challenges. We'll then hear from a variety of cutting edge practitioners, including venture investors, startup founders, government officials, tech journalists and community organizers about the unique opportunities and challenges of building an urban tech startup today.

Tech and the City: How to Get Urban Innovation Right: Read More [+]
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.

**Rules & Requirements**

**UCLA Course Catalog**

**UGBA 175 Legal Aspects of Management**

**Units**

3

**Terms offered:** Fall 2021, Fall 2020, Fall 2019

**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**

**Units**

2

**Terms offered:** Fall 2021, Fall 2020, Fall 2019

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.

**Formerly known as:** Business Administration 179

Legal Aspects of Management: Read Less [-]

**UGBA 177 Special Topics in Business and Public Policy**

**Units**

1 - 4

**Terms offered:** Fall 2021, Spring 2021, Fall 2020

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

Innovations in Communications and Public Relations: Read Less [-]

**UGBA 178 Introduction to International Business**

**Units**

3

**Terms offered:** Fall 2021, Summer 2021 Second 6 Week Session, Fall 2020

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
Terms offered: Fall 2021, Fall 2020, Spring 2020
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 [+]

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 180 Introduction to Real Estate and Urban Land Economics 3 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
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

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

UGBA 183 Introduction to Real Estate Finance 3 Units
Terms offered: Spring 2020, Spring 2019, Spring 2018
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

UGBA 184 Urban and Real Estate Economics 3 Units
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.
Formerly known as: Business Administration 180

Urban and Real Estate Economics: Read Less [-]
UGBA 187 Special Topics in Real Estate Economics and Finance 1 - 4 Units
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.

UGBA 190C Collaborative Innovation 4 Units
Terms offered: Spring 2022, Spring 2020
This is a project-based course in collaborative innovation where students experience group creativity and team-based design by using techniques from across the disciplines of business, theater, design, and art practice. Students will leverage problem framing and solving techniques derived from critical thinking, systems thinking, and creative problem solving (popularly known today as design thinking). The course is grounded in a brief weekly lecture that sets out the theoretical, historical, and cultural contexts for particular innovation practices, but the majority of the class involves hands-on studio-based learning guided by an interdisciplinary team of teachers leading small group collaborative projects.
Collaborative Innovation: Read More [+]
Rules & Requirements
Credit Restrictions: Students will receive no credit for UGBA 190C after completing ART 100, or THEATER 100. A deficient grade in UGBA 190C may be removed by taking ART 100, or THEATER 100.
Hours & Format
Fall and/or spring: 15 weeks - 6 hours of studio per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/ Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructor: Beckman
Collaborative Innovation: Read Less [-]

UGBA 190D Innovation and Design Thinking in Business 2 Units
Terms offered: Spring 2022, Fall 2021, Fall 2020
The goal of this course is to equip students with innovation skills and practices. This is a learn-by-doing lab. Students learn research methods, ethnography, analysis and synthesis, reflective thinking, scenario creation, ideation processes, rapid prototyping cycles and designing experiments, iterative design and how to tell the story of “Never Before Seen” ideas. Class time is spent using hands-on innovation and human-centered design practices. Teams present work for critique and iterative development. The course features short lectures, guest talks, campus-based fieldwork, site visits, research and readings. Projects will be launched in the sessions and each team will be coached and mentored.
Innovation and Design Thinking 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
Instructor: Beckman

UGBA 190S Strategy for the Information Technology Firm 2 - 3 Units
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 - 2-3 hours of lecture per week
Summer: 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.
Instructor: Beckman
Strategy for the Information Technology Firm: Read Less [-]
UGBA 190T Special Topics in Innovation and Design 1 - 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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.

UGBA 191C Communication for Leaders 2 Units
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
Terms offered: Fall 2021, Fall 2020, Fall 2019
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.

UGBA 191L Leadership Communication 1 Unit
Terms offered: Spring 2020, Fall 2019
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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.

UGBA 192A Leading Nonprofit and Social Enterprises 3 Units
Terms offered: Spring 2022, Spring 2020, Spring 2019
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.

Instructor: David Harris

UGBA 192AC Social Movements and Social Media 3 Units
Terms offered: Spring 2020, Spring 2019, Fall 2017
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.

UGBA 192B Strategic Philanthropy 2 Units
Terms offered: Spring 2022, Spring 2021, Spring 2020
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.
Strategic Philanthropy: 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. Alternative to final exam.

Strategic Philanthropy: Read Less [-]
UGBA 192E Social Entrepreneurship 2 Units
Terms offered: Fall 2021, Fall 2019
This course is designed to provide broad exposure to the theories and activities of social entrepreneurship. The inquiry is grounded in real-world examples that illustrate the topics and stimulate thinking, discussion, and learning. Working in groups, students develop a business plan or pitch deck for a social enterprise that addresses an issue that is of interest/concern to the student team. Students with preexisting social enterprise ideas or plans that they would like to further develop and refine are welcomed and encouraged to use this class project as an opportunity to do so.

Social 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. Alternative to final exam.

UGBA 192G Strategic Approaches for Global Social Impact 2 Units
Terms offered: Prior to 2007
The main objective of this course is to help students become effective practitioners in global development and understand career options in the global social sector. The course aims to (i) analyze the historical, sociological and statistical underpinnings of the major issues in global development (conflict, food security, human rights, poverty, health and education), (ii) understand what various organizations can contribute to each issue (government agencies, multilateral institutions, private foundations, NGOs, and private sector companies and entrepreneurs), and (iii) design and analyze approaches to addressing these issues.

Strategic Approaches for Global Social Impact: 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 required.

Social Entrepreneurship: Read Less [-]

UGBA 192H Managing Human Rights in Business 2 Units
Terms offered: Spring 2021
This course, one of the first of its kind offered at a business school, will prepare students for the growing field of practice at the intersection of business and human rights. Students will gain an overview of the international human rights framework and global business and human rights standards and guidelines; analyze the ways in which companies can impact human rights, and to assess the degree to which companies are and should be responsible for human rights impacts; learn to manage a company’s human rights impacts as corporate human rights managers, external consultants, or civil society advocates; and practice the communication skills necessary to successfully address human rights issues within a complex multinational corporation.

Managing Human Rights 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 required.

Managing Human Rights in Business: Read Less [-]

UGBA 192ID Impact Startup Disco 1 Unit
Terms offered: Not yet offered
This is a high-octane, single weekend course (plus one intro day) for students interested in meeting other innovators and getting hands-on experience developing a new impact startup concept. All “social and environmental” impact themes are welcome. The course is inspired by other “hackathon” and startup weekend formats. A structured roadmap helps guide students through a sprint formation and ideation process. All students will be asked to submit an idea during the week prior to the class. After a peer vote selects the top ideas, teams are organically formed during the first session. At the end of the course, each team will present their validated concept and their next steps plan to a panel of impact venture experts.

Impact Startup Disco: Read More [+]

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

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

Impact Startup Disco: Read Less [-]
UGBA 192L Applied Impact Evaluation 2
Units
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.

Applied Impact Evaluation: 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. Alternative to final exam.

Applied Impact Evaluation: Read Less [-]

UGBA 192MC Management Consulting Skills for Social Impact 2 Units
Terms offered: Fall 2021
This course provides a basic understanding of what consultants do and how they do it, and how consulting skills can be applied to thorny problems of social impact. Students will: 1) gain a broad understanding of the management consulting industry, the various consulting models, and how consultants can generate value for their clients in the social sector; 2) learn and practice structured approaches to problem solving used by leading management consultancies; and 3) understand other skills required in management consulting for social impact – such as communicating persuasively and managing projects and client relationships – as well as some of the ethical issues that consultants often face working in the social sector.

Management Consulting Skills for Social Impact: 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. Alternative to final exam.

Management Consulting Skills for Social Impact: Read Less [-]

UGBA 192N Topics in Social Sector Leadership 1 - 5 Units
Terms offered: Spring 2022, Fall 2019, Spring 2019
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.

Topics in Social Sector Leadership: Read More [+]

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

Hours & Format
Fall and/or spring: 15 weeks - 1-5 hours of lecture per week
Summer: 6 weeks - 2.5-12.5 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 Social Sector Leadership: Read Less [-]

UGBA 192P Sustainable Business Consulting Projects 3 Units
Terms offered: Fall 2021, Fall 2020, Fall 2018
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.

Sustainable Business Consulting Projects: 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.

Sustainable Business Consulting Projects: Read Less [-]
UGBA 192S Business and Sustainability 2 Units
Terms offered: Summer 2021 First 6 Week Session, Summer 2020 First 6 Week Session
This course—a mixture of lectures, readings, business cases and corporate speakers—uses theory, frameworks, tools and business cases to teach students how to systematically evaluate and implement sustainability strategies that also maintain or maximize financial returns. Students are taught to identify opportunities to create business value from environmental and social challenges, and to evaluate the competitive implications related to sustainability initiatives. What type of long-term strategies can organizations set to simultaneously foster sustainable development strategy and sound financial practice? How should decision makers make trade-offs between these two organizational objectives? When is “sustainability” also “good business”? Business and Sustainability: 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.

UGBA 192T Topics in Responsible Business 1 - 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
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 Responsible Business: 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 - 2-8 hours of lecture per week

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

UGBA C192R Business, Sustainability, and Society 3 Units
Terms offered: Summer 2021 8 Week Session
As corporations have grown in influence, concerns over their impact on people and the planet have also grown, pushing sustainability, corporate social responsibility, and the wider impact of business into the spotlight. This course focuses on business ethics, supply chains, resource constraints, labor issues, innovation, and environmental externalities, as well as the internal challenges, competitive pressures, external stakeholders, and other issues that businesses must consider while trying to act responsibly. Business, Sustainability, and Society: Read More [+]

Hours & Format
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, with common exam group.
Instructor: Rochlin
Also listed as: ENE,RES C192
Business, Sustainability, and Society: Read Less [-]

UGBA 193B Energy & Civilization 4 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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 Practical Training 0.5 Units
Terms offered: Summer 2014 10 Week Session, Summer 2013 10 Week Session, Summer 2012 10 Week Session
A structured reflective experience on the applied aspects of Business Administration in a professional off-campus environment. The self-selected experience from a CPT employer is designed to provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a real world setting. This applied course is intended for students to enhance their academics through their experience with the experiential learning activity of their choice.
Practical Training: Read More [+]
Rules & Requirements
Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

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. Alternative to final exam.
Practical Training: Read Less [-]

UGBA 193I Business Abroad 4 - 6 Units
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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
Terms offered: Spring 2020, Fall 2019, Spring 2019
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 - 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: Read Less [-]
UGBA 195B Startup and Small-Business Consulting 2 Units
Terms offered: Fall 2021
This course is designed to provide students with an understanding of the concepts and principles for consulting with startups and small businesses. Students will work in self-created teams of 3-4 and can either bid for projects provided by the instructor, or source their own project so long as it fits the course criteria. Course time will include guest lecturers and consulting skills workshops. Student teams will be expected to meet together and with the client outside of class time.

Startup and Small-Business Consulting: 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. Alternative to final exam.

Startup and Small-Business Consulting: Read Less [-]

UGBA 195P Entrepreneurship: How to Successfully start a New Business 3 Units
Terms offered: Fall 2021, Fall 2019, Fall 2018
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
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
Terms offered: Spring 2022, Spring 2021, Spring 2020
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.

Topics in Entrepreneurship: Read More [+]

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.

Topics in Entrepreneurship: Read Less [-]
UGBA C195C Life Sciences, Business, and Entrepreneurship Capstone Course 4 Units
Terms offered: Not yet offered
Blended lecture / Project-based course where student teams build out a business plan for a mock biotech company, demonstrating advanced knowledge in therapeutics and business development. Throughout the course student teams will work toward a final project in which they will identify and present a technology overview, disease overview and explanation of unmet need, a development plan, a commercialization plan, risk mitigation strategy, and financials. Class will include field trips, guest lectures, and a pitch competition with prize.
Life Sciences, Business, and Entrepreneurship Capstone Course: Read More [+]
Rules & Requirements
Prerequisites: Students must be in their fourth and final year of the Life Sciences, Business, and Entrepreneurship Program in order to enroll in this class
Hours & Format
Fall and/or spring: 15 weeks - 4 hours of lecture per week
Additional Details
Subject/Course Level: Undergrad. Business Administration/Undergraduate
Grading/Final exam status: Letter grade. Alternative to final exam.
Instructors: Schaletzky, Dillin
Also listed as: MCELLBI C175
Life Sciences, Business, and Entrepreneurship Capstone Course: Read Less [-]

UGBA 196 Special Topics in Business Administration 1 - 4 Units
Terms offered: Spring 2022, Fall 2021, Spring 2021
Study in various fields of business administration. Topics will vary from year to year and will be announced at the beginning of each semester.
Special Topics in Business Administration: Read More [+]
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
Special Topics in Business Administration: Read Less [-]

UGBA 198 Directed Study 1 - 4 Units
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.
Directed Study: 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 - 1-4 hours of directed group 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 198
Directed Study: Read Less [-]
UGBA 199 Supervised Independent Study and Research 1 - 4 Units
Terms offered: Fall 2020, Spring 2015, Spring 2014
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 [-]