Environmental Engineering Science

Bachelor of Science (BS)

The environmental engineering science (EES) major is an interdisciplinary program pairing engineering fundamentals with courses in the environmental and natural sciences. The EES curriculum provides a broader foundation in the sciences, allowing students to take classes in a variety of departments both inside and outside of the College of Engineering. At the same time, it allows students to focus their studies on environmental issues more than is possible in other engineering programs. EES provides a solid interdisciplinary foundation that is necessary for creating real-world solutions to global environmental challenges, such as providing a robust supply of safe drinking water, and meeting societal demands for energy without causing air pollution or interfering with the Earth's climate systems.

Admission to the Major

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

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

Minor Program

A minor in environmental engineering is available through the Department of Civil and Environmental Engineering.

Other Majors offered by the Engineering Science Program

Energy Engineering (http://guide.berkeley.edu/undergraduate/degree-programs/energy-engineering/) (Major and Minor)
Engineering Mathematics and Statistics (http://guide.berkeley.edu/undergraduate/degree-programs/engineering-math-statistics/) (Major only)
Engineering Physics (http://guide.berkeley.edu/undergraduate/degree-programs/engineering-physics/) (Major only)

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

General Guidelines

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

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

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

Lower Division Major Requirements

MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory [1]	5
or CHEM 4A	General Chemistry and Quantitative Analysis	
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4
CIV ENG 11	Engineered Systems and Sustainability [3]	3
CIV ENG C30/ MEC ENG C85	Introduction to Solid Mechanics	3
Basic science electives, select three from the following: [2]		12-15
BIOLOGY 1A & 1AL	General Biology Lecture and General Biology Laboratory	
BIOLOGY 1B	General Biology Lecture and Laboratory [4]	
CHEM 1B	General Chemistry [4]	
CHEM 3A & 3AL	Chemical Structure and Reactivity and Organic Chemistry Laboratory	
CHEM 3B & 3BL	Chemical Structure and Reactivity and Organic Chemistry Laboratory	
CHEM 4B	General Chemistry and Quantitative Analysis [5] [1]	
EPS 50	The Planet Earth [4]	
PHYSICS 7C	Physics for Scientists and Engineers [4]	

[1] CHEM 4A and CHEM 4B are intended for students majoring in chemistry or a closely-related field.
[2] Approved scores on Biology AP, IB, or A-Level exams can satisfy two of the three basic science electives.
[3] Junior transfer admits are exempt from completing CIV ENG 11.

Upper Division Major Requirements

CIV ENG 100	Elementary Fluid Mechanics	3-4
or MEC ENG 106	Fluid Mechanics	
or CHM ENG 150A	Transport Processes	
CIV ENG C103N/ GEOG C136/ ESPM C130	Terrestrial Hydrology	3-4
or CIV ENG 113	Water Chemistry	
MEC ENG 40	Thermodynamics	3-4
or ENGIN 40	Engineering Thermodynamics	
or CHM ENG 141	Chemical Engineering Thermodynamics	
CIV ENG 111	Environmental Engineering	3

Math/computing elective, select one course from the following:		3-4
ENGIN 117	Methods of Engineering Analysis [3]	
ENGIN 177	Advanced Programming with MATLAB [3]	
MATH 104	Introduction to Analysis [4]	
MATH 110	Abstract Linear Algebra [4]	
MATH 126	Introduction to Partial Differential Equations [4]	
MATH 128A	Numerical Analysis [4]	
MATH 170	Mathematical Methods for Optimization [4]	
MATH 185	Introduction to Complex Analysis [4]	
STAT 133	Concepts in Computing with Data [3]	
STAT 134	Concepts of Probability [4]	
Advanced Science Sequence, select 8-10 units from the following:		8-10
CHEM 12A	Organic Chemistry [5]	
CHEM 12B	Organic Chemistry [5]	
CHEM 120A	Physical Chemistry [3]	
CHEM 120B	Physical Chemistry [3]	
CHEM 125	Physical Chemistry Laboratory [3]	
EPS 101	Field Geology and Digital Mapping [4]	
EPS 103	Introduction to Aquatic and Marine Geochemistry [4]	
EPS 108	Geodynamics [4]	
EPS 109	Computer Simulations with Jupyter Notebooks [4]	
EPS 113	Biological Oceanography and Biogeochemistry [4]	
EPS 116	Structural Geology and Tectonics [3]	
EPS 117	Geomorphology [4]	
EPS 124	Isotopic Geochemistry [4]	
EPS C180	Air Pollution [3]	
EPS C181	Atmosphere, Ocean, and Climate Dynamics [3]	
EPS C182	Atmospheric Chemistry and Physics Laboratory [3]	
ESPM C103	Principles of Conservation Biology [4]	
ESPM 111	Ecosystem Ecology [4]	
ESPM 112	Microbial Ecology [3]	
ESPM 120	Science of Soils [3]	
ESPM C128	Chemistry of Soils [3]	
ESPM 131	Soil Microbiology and Biogeochemistry [3]	
GEOG 142	Global Climate Variability and Change [4]	
MCELLBI 102	Survey of the Principles of Biochemistry and Molecular Biology [4]	
MCELLBI C112 & C112L	General Microbiology and General Microbiology Laboratory	
Cluster courses: select any 12 units from the clusters listed below. [1]		12

[1] The 12 units of cluster courses are in addition to the engineering and science courses used to fulfill other requirements for the major. While the courses are organized by topic, students may take any combination of courses from any of the lists.

Approved Cluster Courses

Air Pollution and Climate Change

ARCH 140	Energy and Environment	4
CIV ENG C106	Air Pollution	3
CIV ENG 107	Climate Change Mitigation	3
EL ENG 134	Fundamentals of Photovoltaic Devices	4
EL ENG 137A	Introduction to Electric Power Systems	4
EL ENG 137B	Introduction to Electric Power Systems	4
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
EPS C183	Carbon Cycle Dynamics	3
MAT SCI 136	Materials in Energy Technologies	4
MEC ENG 109	Heat Transfer	3
MEC ENG 140	Combustion Processes	3
MEC ENG 146	Energy Conversion Principles	3
NUC ENG 161	Nuclear Power Engineering	4

Biotechnology

CHM ENG 140	Introduction to Chemical Process Analysis	4
CHM ENG 142	Chemical Kinetics and Reaction Engineering	4
CHM ENG 150B	Transport and Separation Processes	4
CHM ENG 170A	Biochemical Engineering	4
CHM ENG C170L	Biochemical Engineering Laboratory	3
MCELLBI C112 & C112L	General Microbiology and General Microbiology Laboratory	6
MCELLBI/ PLANTBI C116	Microbial Diversity	3
PLANTBI C112 & C112L	General Microbiology and General Microbiology Laboratory	7
PLANTBI C116	Microbial Diversity	3
PLANTBI 120	Biology of Algae	2
PLANTBI 120L	Laboratory for Biology of Algae	2
PLANTBI 122	Bioenergy	2
PLANTBI 180	Environmental Plant Biology	2

Ecosystems and Ecological Engineering

CIV ENG 113	Ecological Engineering for Water Quality Improvement	3
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
ESPM C103	Principles of Conservation Biology	4
ESPM C104	Modeling and Management of Biological Resources	4
ESPM 111	Ecosystem Ecology	4
ESPM C133	Water Resources and the Environment	3
ESPM 174	Design and Analysis of Ecological Research	4
INTEGBI 151	Plant Physiological Ecology	4
INTEGBI 151L	Plant Physiological Ecology Laboratory	2
INTEGBI C153	Ecology	3
INTEGBI 154	Plant Ecology	3

Environmental Fluid Mechanics

CIV ENG C103N/ GEOG C136/ ESPM C130	Terrestrial Hydrology	4
CIV ENG 105	Design for Global Transformation	3
CIV ENG 173	Groundwater and Seepage	3
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
EPS 117	Geomorphology	4
EPS C129	Biometeorology	3
MEC ENG 165	Ocean-Environment Mechanics	3
MEC ENG 167	Microscale Fluid Mechanics	3

Geoengineering		
CIV ENG 171	Rock Mechanics	3
CIV ENG 173	Groundwater and Seepage	3
CIV ENG 175	Geotechnical and Geoenvironmental Engineering	3
CIV ENG C178	Applied Geophysics	3
CIV ENG 281	Engineering Geology	3
ENGIN 150	Basic Modeling and Simulation Tools for Industrial Research Applications	4
EPS 117	Geomorphology	4
Water Quality		
CIV ENG 110	Water Systems of the Future	3
CIV ENG 111L	Water and Air Quality Laboratory	1
CIV ENG 113	Ecological Engineering for Water Quality Improvement	3
CIV ENG 115	Water Chemistry	3
CIV ENG C116	Chemistry of Soils	3
CIV ENG 173	Groundwater and Seepage	3
ESPM 120	Science of Soils	3
ESPM C133	Water Resources and the Environment	3

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

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

Humanities and Social Sciences (H/SS) Requirement

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

Class Schedule Requirements

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

Minimum Academic Requirements

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

Unit Requirements

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

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

campuses, credit-bearing exams, as well as UC Berkeley Extension XB units.

Normal Progress

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

University of California Requirements

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

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

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

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

Campus Requirement

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

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

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

			Freshman
	Fall Units		**Spring Units**
CHEM 4A or 1A ***and*** 1AL[1]	5	MATH 1B	4
MATH 1A	4	PHYSICS 7A	4
Reading & Composition Part A Course[7]	4	CIV ENG 11[6]	3
Humanities/Social Sciences course[7]	3-4	ENGIN 7	4
	16-17		**15**
			Sophomore
	Fall Units		**Spring Units**
MATH 53	4	MATH 54	4
PHYSICS 7B	4	CIV ENG C30 or MEC ENG C85	3
First Basic Science Elective[2]	4-5	Second and Third Basic Science Electives[2]	8-10
Reading & Composition Part B Course[7]	4		
	16-17		**15-17**
			Junior
	Fall Units		**Spring Units**
CIV ENG 100, MEC ENG 106, or CHM ENG 150A	3-4	MEC ENG 40, ENGIN 40, or CHM ENG 141	3-4
CIV ENG C103N or 115	3-4	Math/ Computing Elective[3]	3-4
CIV ENG 111	3	Cluster courses[4]	6
Humanities/Social Sciences course[7]	3-4	Humanities/ Social Sciences course[7]	3-4
	12-15		**15-18**
			Senior
	Fall Units		**Spring Units**
Cluster course[4]	3	Cluster course[4]	3
Advanced Science Sequence course[5]	4-5	Advanced Science Sequence course[5]	4-5
Free Electives	8	Humanities/ Social Sciences course[7]	3-4
		Free Electives	4
	15-16		**14-16**

Total Units: 118-131

1. CHEM 4A is intended for students majoring in chemistry or a closely-related field.
2. Select three basic science electives from: BIOLOGY 1A plus BIOLOGY 1AL, BIOLOGY 1B, CHEM 1B, CHEM 3A plus CHEM 3AL, CHEM 3B plus CHEM 3BL, CHEM 4B, EPS 50, PHYSICS 7C. Note: approved scores on Biology AP, IB, or A-Level exams can satisfy two of the three basic science electives.
3. Select one from the following: ENGIN 117, ENGIN 177, MATH 104, MATH 110, MATH 126, MATH 128A, MATH 170, MATH 185, STAT 133, or STAT 134.
4. Cluster courses: 12 units required. See Major Requirements tab for list of approved cluster courses.
5. Advanced science sequence: 8-10 units required. See Major Requirements tab for list of approved advanced science sequence courses.
6. Junior transfer admits are exempt from completing CIV ENG 11.
7. The Humanities/Social Sciences (H/SS) requirement includes two approved Reading & Composition (R&C) courses and four additional approved courses, with which a number of specific conditions must be satisfied. R&C courses must be taken for a letter grade (C- or better required). The first half (R&C Part A) must be completed by the end of the freshman year; the second half (R&C Part B) must be completed by no later than the end of the sophomore year. The remaining courses may be taken at any time during the program.

See engineering.berkeley.edu/hss (https://engineering.berkeley.edu/academics/undergraduate-guide/degree-requirements/humanities-and-social-sciences/) for complete details and a list of approved courses.

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 Environmental Engineering Science Major Map PDF. **(**https://vcue.berkeley.edu/sites/default/files/engineering_science.pdf**)**

Environmental Engineering Science

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

ENGIN 1 Engineering Your Life: Skills for Leadership, Discovery and Service 1 Unit

Terms offered: Spring 2024, Spring 2023, Spring 2022
This course provides the framework for engineering an empowered life through leadership, discovery and service. The class focuses on development of self, emotional intelligence, strategic thinking, problem solving, teamwork, diversity, and service learning. Skills include developing of self-awareness; understanding our unique strengths; debunking the imposter syndrome; creating plans of action and setting goals; giving and receiving assessments; interpreting body language; managing time and life-balance; and creating mission statements. Teamwork skills include methods for inspiring others; variations in leadership styles and team dynamics; rhythm of action for projects and teams; difficult conversations and conflict resolution; mechanisms. Engineering Your Life: Skills for Leadership, Discovery and Service: Read More [+]

Objectives & Outcomes

Course Objectives: This course offers the requisite framework for engineering an empowered life. The course provides students with requisite skills for authentic leadership, self-discovery and societal service. These attributes are in alignment with the mission of the College of Engineering and the Berkeley campus.

Student Learning Outcomes: Students will learn how to assess personal strengths, implement plans of action and develop mission statements. Students will learn how to optimize their knowledge with assessment of learning styles along with key communication tools necessary for conflict resolution and inspiration of others (teamwork). Through a series of active exercises and self-reflection activities the students will learn requisite skills for self-discovery and the creation of a personal leadership plan.

Rules & Requirements

Prerequisites: Designed for engineering freshmen, the class is open to all students in the College of Engineering or by permission of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Pruitt

Engineering Your Life: Skills for Leadership, Discovery and Service: Read Less [-]

ENGIN 7 Introduction to Computer Programming for Scientists and Engineers 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
Elements of procedural and object-oriented programming. Induction, iteration, and recursion. Real functions and floating-point computations for engineering analysis. Introduction to data structures. Representative examples are drawn from mathematics, science, and engineering. The course uses the MATLAB programming language. Sponsoring departments: Civil and Environmental Engineering and Mechanical Engineering.
Introduction to Computer Programming for Scientists and Engineers: Read More [+]

Rules & Requirements

Prerequisites: MATH 1B (may be taken concurrently)

Credit Restrictions: Students will receive no credit for Engineering 7 after completing Engineering W7. A deficient grade in Engineering W7 may be repeated by taking Engineering 7.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture, 1 hour of discussion, and 4 hours of laboratory per week

Summer: 10 weeks - 3 hours of lecture, 1.5 hours of discussion, and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: 77

Introduction to Computer Programming for Scientists and Engineers: Read Less [-]

ENGIN W7 Introduction to Computer Programming for Scientists and Engineers 4 Units

Terms offered: Summer 2021 10 Week Session, Summer 2016 10 Week Session, Summer 2015 10 Week Session
Elements of procedural and object-oriented programming. Induction, iteration, and recursion. Real functions and floating-point computations for engineering analysis. Introduction to data structures. Representative examples are drawn from mathematics, science, and engineering. The course uses the MATLAB programming language.
Introduction to Computer Programming for Scientists and Engineers: Read More [+]

Rules & Requirements

Prerequisites: MATH 1B (may be taken concurrently)

Credit Restrictions: Students will receive no credit for Engineering W7 after completing Engineering 7 or 77. A deficient grade in Engineering 7 or 77 may be removed by taking Engineering W7.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of web-based lecture, 4 hours of laboratory, and 1 hour of web-based discussion per week

Summer: 10 weeks - 6 hours of web-based lecture, 0 hours of laboratory, and 7.5 hours of web-based discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Papadopoulos

Introduction to Computer Programming for Scientists and Engineers: Read Less [-]

ENGIN 11 A Hands-on Introduction to Radiation Detection: Getting to know our Radioactive World 3 Units

Terms offered: Spring 2024, Fall 2023, Spring 2023
Introduction to basic concepts in radiation detection and radioactivity, electrical circuits, and data analytics. Lectures provide the theoretical foundation of the work being performed in the accompanying laboratory. The course will contain three sections: introduction to how radiation interacts with matter and radiation detection technologies; development of the tools (mathematical and computational) needed for analyzing various types of radiation and environmental data; and building of a basic radiation sensor system.
A Hands-on Introduction to Radiation Detection: Getting to know our Radioactive World: Read More [+]

Objectives & Outcomes

Course Objectives: The course is suitable for Nuclear Engineering students, other Engineering majors, and any students interested in gaining a general understanding of radiation detection.
The focus of this course will be on the application of the nuclear science, radiation detection, and data analysis concepts covered to the building of a multi-sensor radiation detection system, following a template for the required data acquisition software and circuit integration.
Fieldwork related to a chosen research topic will be carried out in small groups, with group oral presentations and final reports. Students will be introduced to research opportunities on campus and at nearby lab facilities through tours of lab spaces throughout the department and field trips to LBNL and LLNL.

Students will be introduced to core concepts in nuclear science, statistical analysis, and computation, while being given practical experience applying those concepts to radiation detection and data analysis.
The objective of this course is to provide Freshman and Sophomore students with an introduction to the fundamentals of nuclear radiation and radiation detection through a hands-on approach.

Student Learning Outcomes: Be able to outline and carry out a research project, prepare written and oral presentations of that work, and demonstrate how the sensors they built work.
By the end of this course, students should be able to:
Identify types of radioactivity, radiation detection methods and sources of environmental radiation,

Create simple circuit designs making use of standard circuitry components, demonstrate basic soldering skills, and demonstrate a familiarity with printed circuit board design tools,
Make use of software tools including the Python programming language, version control with git, and shell environments,
Perform statistical analysis of large data sets and quantify statistical and systematic uncertainties in experimental data,

Rules & Requirements

Credit Restrictions: Students will receive no credit for ENGIN 11 after completing ENGIN 11. A deficient grade in ENGIN 11 may be removed by taking ENGIN 11.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

ENGIN 24 Freshman Seminar 1 Unit

Terms offered: Fall 2024, Spring 2024, Fall 2023
The Berkeley Seminar Program is designed to provide students with the opportunity to explore an intellectual topic with a faculty member in a small seminar setting. Berkeley Seminars are offered in all college departments, and topics vary from department to department and semester to semester.
Freshman Seminar: 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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Freshman Seminar: Read Less [-]

ENGIN 25 Visualization for Design 2 Units

Terms offered: Fall 2020, Spring 2020, Fall 2019
Development of 3-dimensional visualization skills for engineering design. Sketching as a tool for design communication. Presentation of 3-dimensional geometry with 2-dimensional engineering drawings. This course will introduce the use of 2-dimensional CAD on computer workstations as a major graphical analysis and design tool. A group design project is required. Teamwork and effective communication are emphasized.
Visualization for Design: Read More [+]
Objectives & Outcomes

Course Objectives: Improve 3-dimensional visualization skills; enable a student to create and understand engineering drawings; introduce 2-dimensional computer-aided geometry modeling as a visualization, design, and analysis tool; enhance critical thinking and design skills; emphasize communication skills, both written and oral; develop teamwork skills; offer experience in hands-on engineering projects; develop early abilities in identifying, formulating, and solving engineering problems; introduce students to the societal context of engineering practice.

Student Learning Outcomes: Upon completion of the course, students shall be able to communicate 3-dimensional geometry effectively using sketches; operate 2-dimensional CAD software with a high degree of skill and confidence; understand and create engineering drawings; visualize 3-dimensional geometry from a series of 2-dimensional drawings.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: Lieu, McMains

Visualization for Design: Read Less [-]

ENGIN 26 Three-Dimensional Modeling for Design 2 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
Three-dimensional modeling for engineering design. This course will emphasize the use of CAD on computer workstations as a major graphical analysis and design tool. Students develop design skills, and practice applying these skills. A group design project, design and fabrication (3D print) of the tower and rotor is required. Hands-on creativity, teamwork, and effective communication are emphasized.
Three-Dimensional Modeling for Design: Read More [+]
Objectives & Outcomes

Course Objectives: Develop teamwork skills; offer experience in hands-on, creative engineering projects.
Enhance critical thinking and design skills; emphasize communication skills, both written and oral.
Introduce computer-based solid, parametric, and assembly modeling as a tool for engineering design.
Reinforce the societal context of engineering practice; develop early abilities in identifying, formulating, and solving engineering problems.

Student Learning Outcomes: Create a 3D solid model of a complicated object with high degree of confidence.
Extract 2D orthographic views from the 3D model for fabrication.
Extract section and auxiliary views.
Specify the proper dimensions, according to industry standards, for parts to be fabricated.

Understand the basics of assembly and associative constraints.
Understand the basics of rapid prototyping, in particular 3D printing.
Understand the engineering design process and the implementation of different design phases.
Work effectively as a member of a design team.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: Youssefi, Mcmains

Three-Dimensional Modeling for Design: Read Less [-]

ENGIN 27 Introduction to Manufacturing and Tolerancing 2 Units

Terms offered: Summer 2021 10 Week Session, Fall 2020, Summer 2020 10 Week Session
Geometric dimensioning and tolerancing (GD&T), tolerance analysis for fabrication, fundamentals of manufacturing processes (metal cutting, welding, joining, casting, molding, and layered manufacturing).
Introduction to Manufacturing and Tolerancing: Read More [+]
Objectives & Outcomes

Course Objectives: Enable a student to create and understand tolerances in engineering drawings; enhance critical thinking and design skills; emphasize communication skills, both written and oral; offer hands-on experience in manufacturing; develop abilities in identifying, formulating, and solving engineering problems; introduce students to the context of engineering practice.

Student Learning Outcomes: Upon completion of the course, students shall be able to fabricate basic parts in the machine shop; understand and communicate tolerance requirements in engineering drawings using industry standard GD&T; use metrology tools to evaluate if physical parts are within specified tolerances; demonstrate familiarity with manufacturing processes; and design parts that can be fabricated realistically and economically using these processes.

Rules & Requirements

Prerequisites: ENGIN 25 (may be taken concurrently)

Hours & Format

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

Summer: 10 weeks - 1.5 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: McMains, Lieu, Taylor

Introduction to Manufacturing and Tolerancing: Read Less [-]

ENGIN 29 Manufacturing and Design Communication 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
An introduction to manufacturing process technologies and the ways in which dimensional requirements for manufactured objects are precisely communicated, especially through graphical means. Fundamentals of cutting, casting, molding, additive manufacturing, and joining processes are introduced. Geometric dimensioning and tolerancing (GD&T), tolerance analysis for fabrication, concepts of process variability, and metrology techniques are introduced and practiced. 3-D visualization skills for engineering design are developed via sketching and presentation of 3-D geometries with 2-D engineering drawings. Computer-aided design software is used. Teamwork and effective communication are emphasized through lab activities and a design project.
Manufacturing and Design Communication: Read More [+]
Objectives & Outcomes

Course Objectives: Develop early abilities in identifying, formulating, and solving engineering problems.
Emphasize communication skills, both written and oral; develop teamwork skills.
Enable a student to create and understand tolerances in engineering drawings.
Enhance critical thinking and design skills.
Improve 3-dimensional visualization skills; enable a student to create and understand engineering drawings.
Introduce 2-dimensional computer-aided geometry modeling as a visualization, design, and analysis tool.
Introduce students to the societal context of engineering practice.
Offer an experience in hands-on engineering projects.

Student Learning Outcomes: A knowledge of contemporary issues.
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 design and conduct experiments, as well as to analyze and interpret data.
An ability to identify, formulate, and solve engineering problems.
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
An understanding of professional and ethical responsibility.

Rules & Requirements

Prerequisites: ENGIN 26 or equivalent experience in three-dimensional solid modeling (e.g. Solidworks, Fusion 360) is recommended

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: Engineering/Undergraduate

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

Instructors: Taylor, Hayden, Mcmains, Sarah, Stuart, Hannah

ENGIN 39B Freshman/Sophomore Seminar 1.5 - 4 Units

Terms offered: Spring 2010, Spring 2009, Spring 2008
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. Enrollment limits are set by the faculty, but the suggested limit is 25.
Freshman/Sophomore Seminar: Read More [+]

Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 1.5-4 hours of seminar per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Freshman/Sophomore Seminar: Read Less [-]

ENGIN 39E Freshman/Sophomore Seminar 1.5 - 4 Units

Terms offered: Spring 2010, Spring 2009, Spring 2008
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. Enrollment limits are set by the faculty, but the suggested limit is 25.
Freshman/Sophomore Seminar: Read More [+]

Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 1.5-4 hours of seminar per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Freshman/Sophomore Seminar: Read Less [-]

ENGIN 39F Freshman/Sophomore Seminar 1.5 - 4 Units

Terms offered: Fall 2010
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. Enrollment limits are set by the faculty, but the suggested limit is 25.
Freshman/Sophomore Seminar: Read More [+]

Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 1.5-4 hours of seminar per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Freshman/Sophomore Seminar: Read Less [-]

ENGIN 40 Engineering Thermodynamics 4 Units

Terms offered: Fall 2024, Fall 2023, Fall 2022
Fundamental laws of thermodynamics for simple substances; application to flow processes and to nonreacting mixtures; statistical thermodynamics of ideal gases and crystalline solids; chemical and materials thermodynamics; multiphase and multicomponent equilibria in reacting systems; electrochemistry. Sponsoring Departments: Materials Science and Engineering and Nuclear Engineering.
Engineering Thermodynamics: Read More [+]

Rules & Requirements

Prerequisites: PHYSICS 7B and MATH 54. CHEM 1B recommended

Credit Restrictions: Students will receive no credit for Engineering 40 after taking Engineering 115, Chemical Engineering 141 or Mechanical Engineering 40.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: Bolind, Persson

Engineering Thermodynamics: Read Less [-]

ENGIN 47 Supplementary Work in Lower Division Engineering 1 - 3 Units

Terms offered: Spring 2022, Fall 2016, Fall 2012
May be taken only with permission of the Dean of the College of Engineering. Students with partial credit in a lower division engineering course may complete the work under this heading.
Supplementary Work in Lower Division Engineering: Read More [+]
Rules & Requirements

Prerequisites: Limited to students who must make up a fraction of a required lower division course

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: 8 weeks - 1.5-5.5 hours of independent study per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Supplementary Work in Lower Division Engineering: Read Less [-]

ENGIN 92 Perspectives in Engineering 1 Unit

Terms offered: Fall 2024, Fall 2023, Fall 2022
This series of lectures provides students, especially undeclared Engineering students, with information on the various engineering disciplines to guide them toward choice of major. Lecturers describe research activities, how they made their own career choices, and indicate future opportunities. Recommended for all Engineering Science students and required for Engineering undeclared students.
Perspectives in Engineering: 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 lecture per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Perspectives in Engineering: Read Less [-]

ENGIN 93 Energy Engineering Seminar 1 Unit

Terms offered: Fall 2024, Fall 2023, Fall 2022
Weekly seminar with different speakers on energy-related topics. The goal is to expose students to a broad range of energy issues.
Energy Engineering Seminar: Read More [+]
Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Zohdi

Energy Engineering Seminar: Read Less [-]

ENGIN 98 Directed Group Studies for Lower Division Undergraduates 1 - 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
Seminars for group study of selected topics, which will vary from year to year. Intended for students in the lower division.
Directed Group Studies for Lower Division Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

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

Hours & Format

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

Summer:
6 weeks - 2.5-10 hours of directed group study per week
8 weeks - 1.5-7.5 hours of directed group study per week
10 weeks - 1.5-6 hours of directed group study per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Directed Group Studies for Lower Division Undergraduates: Read Less [-]

ENGIN 117 Methods of Engineering Analysis 3 Units

Terms offered: Fall 2023, Fall 2019, Fall 2017
Methods of theoretical engineering analysis; techniques for analyzing partial differential equations and the use of special functions related to engineering systems. Sponsoring Department: Mechanical Engineering.
Methods of Engineering Analysis: Read More [+]
Rules & Requirements

Prerequisites: MATH 53 and MATH 54

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Methods of Engineering Analysis: Read Less [-]

ENGIN 120 Principles of Engineering Economics 3 Units

Terms offered: Fall 2023, Fall 2022, Spring 2022
Economic analysis for engineering decision making: Capital flows, effect of time and interest rate. Different methods of evaluation of alternatives. Minimum-cost life and replacement analysis. Depreciation and taxes. Uncertainty; preference under risk; decision analysis. Capital sources and their effects. Economic studies.
Principles of Engineering Economics: Read More [+]
Rules & Requirements

Prerequisites: Completion of 60 units of an approved engineering curriculum

Credit Restrictions: Students will receive no credit for Engineering 120 after taking Industrial Engineering 120.

Hours & Format

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

Summer: 8 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Adler

Principles of Engineering Economics: Read Less [-]

ENGIN 125 Ethics, Engineering, and Society 3 Units

Terms offered: Fall 2024, Spring 2024, Spring 2023
How should engineers analyze and resolve the ethical issues inherent in engineering? This seminar-style course provides an introduction to how theories, concepts, and methods from the humanities and social science can be applied to ethical problems in engineering. Assignments incorporate group and independent research designed to provide students an opportunity to contribute novel findings to the emerging field of engineering ethics while building their analytical and communication skills. This course cannot be used to fulfill any engineering technical requirements (units or courses).
Ethics, Engineering, and Society: Read More [+]
Hours & Format

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

Summer:
6 weeks - 5 hours of lecture and 3 hours of discussion per week
8 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Ethics, Engineering, and Society: Read Less [-]

ENGIN 128 Advanced Engineering Design Graphics 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021
Advanced graphics tools for engineering design. Parametric solid modeling. Assembly modeling. Presentation using computer animation and multimedia techniques.
Advanced Engineering Design Graphics: Read More [+]
Rules & Requirements

Prerequisites: 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: Engineering/Undergraduate

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

Instructor: Lieu

Advanced Engineering Design Graphics: Read Less [-]

ENGIN 147 Supplementary Work in Upper Division Engineering 1 - 3 Units

Terms offered: Fall 2016, Fall 2015, Spring 2015
May be taken only with permission of the Dean of the College of Engineering. Students with partial credit in an upper division engineering course may complete the work under this heading.
Supplementary Work in Upper Division Engineering: Read More [+]

Rules & Requirements

Prerequisites: Limited to students who must make up a fraction of a required upper division course

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Supplementary Work in Upper Division Engineering: Read Less [-]

ENGIN 150 Basic Modeling and Simulation Tools for Industrial Research Applications 4 Units

Terms offered: Fall 2021, Fall 2019, Fall 1997
The course emphasizes elementary modeling, numerical methods & their implementation on physical problems motivated by phenomena that students are likely to encounter in their careers, involving biomechanics, heat-transfer, structural analysis, control theory, fluid-flow, electrical conduction, diffusion, etc. This will help students develop intuition about the strengths and weaknesses of a variety of modeling & numerical methods, as well as develop intuition about modeling physical systems & strengths and weaknesses of a variety of numerical methods, including: Discretization of differential equations, Methods for solving nonlinear systems, Gradient-based methods and machine learning algorithms for optimization, stats & quantification
Basic Modeling and Simulation Tools for Industrial Research Applications: Read More [+]

Rules & Requirements

Prerequisites: ENGIN 7 or COMPSCI 61A, PHYSICS 7A, MATH 53, and MATH 54

Credit Restrictions: Students will receive no credit for ENGIN 150 after completing ENGIN 150. A deficient grade in ENGIN 150 may be removed by taking ENGIN 150.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Basic Modeling and Simulation Tools for Industrial Research Applications: Read Less [-]

ENGIN 151 Modeling and Simulation of Infectious Diseases 3 Units

Terms offered: Prior to 2007
The course emphasizes elementary modeling, numerical methods and their implementation on physical problems motivated by real-world phenomena involving various aspects of infection diseases. This course is broken into five parts: part 1-modeling and simulation of the infection zone from respiratory emission, part 2-rapid simulation of viral decontamination efficacy with uv irradiation, part 3-an agent-based computational framework for simulation of global pandemic and social response, part 4-machine learning and parameter identification, part 5-deep dive into advanced models: continuum mechanics, solid-fluid interaction and electromagnetism.
Modeling and Simulation of Infectious Diseases: Read More [+]

Objectives & Outcomes

Course Objectives: Comprised of an introduction to essential mathematical modeling and simulation tools needed for various aspects of the modeling and simulation of infectious diseases. Six capstone projects, drawn from Parts 1-5 are assigned, applying the modeling and simulation tools.

Rules & Requirements

Prerequisites: ENGIN 7, COMPSCI 61A, or DATA C8 + COMPSCI 88; and PHYSICS 7A; and MATH 53 AND MATH 54

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Tarek Zohdi

Modeling and Simulation of Infectious Diseases: Read Less [-]

ENGIN 157AC Engineering, The Environment, and Society 4 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022
This course engages students at the intersection of environmental justice, social justice, and engineering to explore how problems that are commonly defined in technical terms are at their roots deeply socially embedded. Through partnerships with community-based organizations, students are trained to recognize the socio-political nature of technical problems so that they may approach solutions in ways that prioritize social justice. Topics covered include environmental engineering as it relates to air, water, and soil contamination; race, class, and privilege; expertise; ethics; and engaged citizenship. This course cannot be used to complete any engineering technical unit requirements.
Engineering, The Environment, and Society: 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: Engineering/Undergraduate

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

Also listed as: IAS 157AC

Engineering, The Environment, and Society: Read Less [-]

ENGIN 170A Technology Leadership 3 Units

Terms offered: Summer 2024 Second 6 Week Session, Fall 2005, Fall 2004
This course covers management and innovation for technology firms. It provides an in-depth look at how technology firms decide on which organization model to use in order to reduce silos and leverage the different parts of the firm to create a greater whole. Next, an in-depth look at how well structured firms optimize technology strategy and operations. The workshop then covers how optimally organized firms create innovation programs and corporate incubators.
Technology Leadership: Read More [+]
Hours & Format

Summer:
6 weeks - 6 hours of lecture per week
8 weeks - 5 hours of lecture per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Technology Leadership: Read Less [-]

ENGIN 170B Commercializing Deep Tech Innovations 3 Units

Terms offered: Summer 2024 8 Week Session, Spring 2006, Spring 2005
Commercializing deep-tech innovations requires an interdisciplinary approach that considers the development of the technology, identification of business opportunities, and consideration of legal implications. This course will explore deep technology commercialization at the interface of business, technology, and intellectual property. Students with a stem or engineering background will collaborate on real-world, deep-tech commercialization projects from leading research institutions. Students will work in teams on a technology developed by inventors from world renowned research laboratories. The student teams will analyze patents, the technology landscape, and the market to assess the potential of commercializing technology.
Commercializing Deep Tech Innovations: Read More [+]
Objectives & Outcomes

Course Objectives: Students will read and discuss case studies related to tech strategies deployed by start-ups, and established enterprises. The course will prepare the students to analyze deep technologies from the ground up. They will deliver an oral slide presentation that answers the questions listed below in a clear and concise manner.

- What is the technology?
- What problem is your technology trying to solve?
- What are the potential markets in which it could be commercialized?
- For which application is your technology best positioned? Why?
- Who are the competitors? How does the technology compare with competing technical solutions? What are the key differences in terms of technical performance and customer utility?
- What is the market potential of your chosen application areas/segments?
- What is the SWOT of your commercial strategy in your chosen application/segment?
- What is your market entry/go to market plan? Licensing, Start-up or something else?

Rules & Requirements

Prerequisites: Students must have strong oral and written English skills, and a demonstrated background in STEM, engineering, or business

Credit Restrictions: Students will receive no credit for ENGIN 170B after completing ENGIN 170B. A deficient grade in ENGIN 170B may be removed by taking ENGIN 170B.

Hours & Format

Summer: 8 weeks - 5 hours of lecture per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Commercializing Deep Tech Innovations: Read Less [-]

ENGIN 170C Agile Product Development 3 Units

Terms offered: Summer 2024 8 Week Session
This course is designed to give students the opportunity to experience a full cycle of product development by developing and refining series of prototypes leading to delivering a functioning MVP (Minimally Viable Product). Students form small teams to identify a problem, followed by ideation to come up with a product idea that will help solving a real problem. Students will be introduced to professional product development processes & approaches through series of lectures, case study analysis, simulations, and exercises. Students will then design a product that will solve these real problems and start implementing series of 3 prototypes culminating with a working product MVP.
Agile Product Development: Read More [+]

Objectives & Outcomes

Student Learning Outcomes: The program will also allow students to develop a number of 'soft' skills such as leadership, team development, conflict resolution, stakeholder management, project management in an intensive, experiential learning environment that includes regular pitches and feedback from mentors. Mixed interdisciplinary teams will be created and mandated.
The art of successfully communicating the idea is critical throughout the program and in particular during the final pitches in the final week. Students will practice explaining their products throughout the course: first to their classmates and mentors followed by presenting the prototypes to real prospective users.

Hours & Format

Summer: 8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Agile Product Development: Read Less [-]

ENGIN 177 Advanced Programming with MATLAB 3 Units

Terms offered: Spring 2017, Spring 2015, Spring 2014
The course builds an understanding, demonstrates engineering uses, and provides hand-on experience for object-oriented programming as well as exposes a practical knowledge of advanced features available in MATLAB. The course will begin with a brief review of basic MATLAB features and quickly move to class organization and functionality. The introduced concepts are reinforced by examining the advanced graphical features of MATLAB. The material will also include the effective use of programs written in C and FORTRAN, and will cover SIMULINK, a MATLAB toolbox providing for an effective ways of model simulations. Throughout the course, the emphasis will be placed on examples and homework assignments from engineering disciplines.
Advanced Programming with MATLAB: Read More [+]

Rules & Requirements

Prerequisites: ENGIN 7, MATH 53 and MATH 54 (one of these math courses may be taken concurrently)

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: Frenklach, Packard

Advanced Programming with MATLAB: Read Less [-]

ENGIN 178 Statistics and Data Science for Engineers 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
This course provides a foundation in data science with emphasis on the application of statistics and machine learning to engineering problems. The course combines theoretical topics in probability and statistical inference with practical methods for solving problems in code. Each topic is demonstrated with examples from engineering. These include hypothesis testing, principal component analysis, clustering, linear regression, time series analysis, classification, and deep learning. Math 53 and 54 are recommended before Engin 178, Math 53 and 54 are allowed concurrently.
Statistics and Data Science for Engineers: Read More [+]
Objectives & Outcomes

Course Objectives: To demonstrate the use of data science in engineering tasks.
To enable students to import, clean, visualize, and interpret data sets using modern computer languages.
To familiarize students with a range of techniques for building models from data.
To introduce the concepts of quantitative statistics and probability.
To provide a theoretical and conceptual basis for students to understand the role of data in engineering.
To teach students how to build and train machine learning models.

Student Learning Outcomes: A knowledge of contemporary issues.
An ability to apply knowledge of mathematics, science, and engineering.
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 design and conduct experiments, as well as to analyze and interpret data.
An ability to identify, formulate, and solve engineering problems.
An 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.

Rules & Requirements

Prerequisites: ENGIN 7, MATH 1A, MATH 1B MATH 53, and MATH 54 (may be taken concurrently)

Credit Restrictions: Students will receive no credit for ENGIN 178 after completing ENGIN 78. A deficient grade in ENGIN 178 may be removed by taking ENGIN 78.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Papadopoulos

Statistics and Data Science for Engineers: Read Less [-]

ENGIN 180 Preparing for the Fields and Jobs of the Future 3 Units

Terms offered: Spring 2018
The course is concerned with giving students the tools to prepare for the fields and jobs of the future.
Across all university departments and majors, the numbers of students who do not work in the fields in which they've received their degrees is not only significant, but growing. For example, anywhere from 20-40% of STEM graduates do not work in the fields in which they received their degrees.
This does not mean that students shouldn't major in STEM, but that one of the primary purposes of higher education is learning how to learn. Accordingly, this course presents a number of frameworks that are critical for thinking about that which has not yet been invented.
Preparing for the Fields and Jobs of the Future: Read More [+]
Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructor: Ian I. Mitroff

Preparing for the Fields and Jobs of the Future: Read Less [-]

ENGIN 183 Special Topics in Technology Innovation and Entrepreneurship 1 - 4 Units

Terms offered: Fall 2024, Summer 2024 Second 6 Week Session, Spring 2024
This course will explore various topics around technology innovation and entrepreneurship. Topics will vary by semester.
Special Topics in Technology Innovation and Entrepreneurship: 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 seminar per week

Summer:
6 weeks - 2.5-10 hours of seminar per week
8 weeks - 1.5-7.5 hours of seminar per week
10 weeks - 1.5-6 hours of seminar per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 190E

Special Topics in Technology Innovation and Entrepreneurship: Read Less [-]

ENGIN 183A A. Richard Newton Lecture Series 1 Unit

Terms offered: Fall 2024, Spring 2024, Fall 2023
This lecture series serves as an entry point for undergraduate and graduate curriculum sequences in entrepreneurship and innovation. The series, established in 2005, is named in honor of A. Richard Newton, a visionary technology industry leader and late dean of the University of California Berkeley College of Engineering. The course features a selection of high-level industry speakers who share their insights on industry developments, leadership, and innovation based on their careers.
A. Richard Newton Lecture Series: Read More [+]
Rules & Requirements

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

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of colloquium per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 195

A. Richard Newton Lecture Series: Read Less [-]

ENGIN 183B Berkeley Method of Entrepreneurship Bootcamp 2 Units

Terms offered: Fall 2024, Summer 2024 Second 6 Week Session, Spring 2024
This course offers the opportunity to understand the Berkeley Method of Entrepreneurship (BME) in an intensive format. The BME curriculum conveys the latest approaches for training global technology entrepreneurs. This method leverages insights on strategy, tactics, culture, and psychology with an accompanying entrepreneurial infrastructure. The curriculum is structured to provide an optimal global entrepreneurship experience from real life experiences.
Berkeley Method of Entrepreneurship Bootcamp: Read More [+]
Objectives & Outcomes

Course Objectives: * To understand and make use of the value of diversity in idea generation and new venture creation.
Student should become aware of the infrastructure available through UC Berkeley that an support them in developing new ventures.
To understand common tactics in starting new ventures including a lean learning cycle.
To understand the mindset of an entrepreneur, including the soft skills, behaviors, and psychological factors most likely to be needed to develop a new venture.

Student Learning Outcomes: Students should be able to consider a greater number of ideas for global entrepreneurship by observing the effect of background diversity in the class.
Students should be able to follow a process of idea generation, rapid prototyping / venture story development, attraction of stakeholders, data collection, and hypothesis testing and regeneration.
Students should become aware of the mindset and behaviour required for entreprenurship and be able to reinforce some of these behavious (eg rejection tolerance, comfort with failing or being wrong, inductive learning, venture story telling/communication abilities) through excercizes in the program.

Rules & Requirements

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

Hours & Format

Fall and/or spring: 1 weeks - 30 hours of lecture and 20 hours of discussion per week

Summer: 1 weeks - 30 hours of lecture and 20 hours of discussion per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 192

Berkeley Method of Entrepreneurship Bootcamp: Read Less [-]

ENGIN 183C Challenge Lab 4 Units

Terms offered: Fall 2024, Summer 2024 Second 6 Week Session, Spring 2024

This course is meant for students in engineering and other disciplines who seek a challenging, interactive, team-based, and hands-on learning experience in entrepreneurship and technology. In this highly experiential course, students work in simulated start-up teams to create products or start-up ideas to address a broadly-defined need of an industry partner or social challenge.

Challenge Lab: Read More [+]

Objectives & Outcomes

Course Objectives: 1)
To catalyze learning through experiential entrepreneurship
2)
To help students understand the entrepreneurial context, and how it can create better outcomes.
3)
To help students identify the best role for themselves within an entrepreneurial organization.

Student Learning Outcomes: 1)
Gain experience with effectively refining ideas and pivoting based on feedback and external factors.
2)
Gain experience building effective teams to develop and execute an idea
3)
Become comfortable with failure and how to learn from failure.
4)
Become adept at succinctly communicating ideas in terms of value proposition and business viability.

Rules & Requirements

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

Hours & Format

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

Summer:
6 weeks - 10 hours of seminar per week
8 weeks - 7.5 hours of seminar per week
10 weeks - 6 hours of seminar per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 185

Challenge Lab: Read Less [-]

ENGIN 183D Product Management 3 Units

Terms offered: Spring 2024, Spring 2023, Fall 2022

Too often we are enamored in our brilliant ideas, we skip the most important part: building products consumers will want and use. Precious time and effort is wasted on engineering perfect products only to launch to no users. This course teaches product management skills such as attributes of great product managers, reducing risk and cost while accelerating time to market, product life cycle, stakeholder management and effective development processes.

Product Management: Read More [+]

Objectives & Outcomes

Course Objectives: •
Students will experience a live development of a product within the context of a product development process.
•
Students will learn common methods used in product management
•
Students will understand the difference between engineering design and product development as a process commonly used in new venture environments.

Student Learning Outcomes: •
Students will actually develop a real world functioning product, to be described as Minimum Viable.
•
Students will be able to manage a product development process that leads to a product that is technically feasible as well as desired by customers.
•
Students will gain experience needed to work as product managers in real life environments.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 186

Product Management: Read Less [-]

ENGIN 183E Technology Entrepreneurship 3 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
This course explores key entrepreneurial concepts relevant to the high-technology world. Topics include the entrepreneurial perspective, start-up strategies, business idea evaluation, business plan writing, introduction to entrepreneurial finance and venture capital, managing growth, and delivering innovative products. This course prepares technical and business minded students for careers focused on entrepreneurship, intrapreneurship, and high technology. Students undertake intensive study of actual business situations through rigorous case-study analysis. This course can not be used to fulfill any engineering requirement (engineering units, courses, technical electives, or otherwise).
Technology Entrepreneurship: Read More [+]

Rules & Requirements

Prerequisites: Junior or senior standing

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Formerly known as: Industrial Engin and Oper Research 191

Technology Entrepreneurship: Read Less [-]

ENGIN 184 Writing Robots 3 Units

Terms offered: Spring 2024
This writing-intensive course surveys and analyzes accounts of AI-generated
writing, while reflecting on the ramifications of AI for human writing practices. In other
words: how do we write about—as well as with—writing machines? How are emergent AI
writing technologies reshaping human writing cultures in STEM fields and beyond? How,
in turn, do accounts of and interactions with writing machines shape cultural conceptions
of human writers and thinkers, as well as technological frontiers for AI developers? What
does it mean to write for someone else, or to let someone or something else write for us?
How do preoccupations fundamental to all writing—audience, context, aims, and
aesthetics—shape both non-human and human writing?
Writing Robots: Read More [+]

Objectives & Outcomes

Course Objectives: To address these questions, we will analyze a broad range of texts framing these
questions, including chat transcripts, essays, and journal articles, alongside novels, plays,
and podcasts. Students will track and research a sub-topic of their choosing through a
cumulative series of summaries, essays, and opinion pieces, while chronicling their
developing writerly identities by reflecting on readings and assignments in a course
journal. At semester's end, they will revise and present a writing portfolio reflecting their
strongest work.

Student Learning Outcomes: By the end of this course, students will be able to
1) Analyze how technological developments are communicated to different
audiences
2) Identify, reframe, and synthesize explanations of a particular technology.
3) Support arguments about technology and science-related topics using those
identified and synthesized elements
4) Develop and articulate a set of writerly practices, preferences, and beliefs in
relation to automatic writing.

Rules & Requirements

Prerequisites: Reading and Composition R1A and R1B

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Writing Robots: Read Less [-]

ENGIN 185 The Art of STEM Communication 3 Units

Terms offered: Summer 2024 Second 6 Week Session, Spring 2024, Summer 2023 First 6 Week Session
This course provides engineering majors with the fundamental skills for effective technical communication. During the course of the semester, students will develop communications for public dissemination, covering a project or initiative within UC Berkeley's College of Engineering. This work will call on students to: (a) cultivate interest in a broad range of topics related to Engineering; (b) become an engaged and critical reader of academic and general-interest science publications; (c) learn how to assess, plan for, and respond to a variety of communicative situations; (d) produce focused, and at the same time, narratively-rich, accounts of Engineering research.
The Art of STEM Communication: Read More [+]
Hours & Format

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

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

The Art of STEM Communication: Read Less [-]

ENGIN 187 Global Engineering: The Challenges of Globalization and Disruptive Innovation 1 or 2 Units

Terms offered: Fall 2019
The course examines the challenges of innovation beyond new technology development: from the challenges of global expansion, to the issues of unintended consequences of technology and the ability of technology to support or hinder social justice. The course will provide examples in a variety of global locations (e.g., Latin America, Southeast Asia, Africa, China, and India), utilizing case examples (written and presented by speakers) that illustrate the challenges faced in a range of fields of engineering and technology, from water and transportation to information and communications technology, and from start-ups to major corporations, government entities, and policy makers.
Global Engineering: The Challenges of Globalization and Disruptive Innovation: Read More [+]
Rules & Requirements

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

Hours & Format

Fall and/or spring: 8 weeks - 2-4 hours of lecture per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Global Engineering: The Challenges of Globalization and Disruptive Innovation: Read Less [-]

ENGIN 194 Undergraduate Research 3 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023
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. Final report and presentation required.
Undergraduate Research: Read More [+]
Rules & Requirements

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

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

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Undergraduate Research: Read Less [-]

ENGIN 195A Engineering Science Senior Thesis Research 1 - 3 Units

Terms offered: Fall 2024, Fall 2023, Fall 2022
Thesis work under the supervision of a faculty member. To obtain full credit, the student must submit a satisfactory thesis at the end of two semesters of research. A total of four units must be taken. The units must be distributed between the two semesters (2 units in E195A and 2 units in E195B, or 1+3 or 3+1). Note, completion of a senior thesis does not contribute toward graduation requirements.
Engineering Science Senior Thesis Research: Read More [+]

Objectives & Outcomes

Course Objectives: Gain experience conducting an independent research project in science and/or engineering.
Report research outcomes in a written thesis.

Student Learning Outcomes: Develop familiarity reading scientific literature
Gain expertise in a field closely related to their coursework
Gain practice asking research questions and managing an independent project
Learn how to communicate scientific ideas and methods in a research thesis
Practice good teamwork with their fellow research students and their supervisor

Rules & Requirements

Prerequisites: Must be an Engineering Science student with senior standing, with one fall and one spring semester remaining, and an overall UC GPA of at least 3.3

Hours & Format

Fall and/or spring: 15 weeks - 3-9 hours of independent study per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Engineering Science Senior Thesis Research: Read Less [-]

ENGIN 195B Engineering Science Senior Thesis Research 1 - 3 Units

Terms offered: Spring 2024, Spring 2023
Thesis work under the supervision of a faculty member. To obtain full credit, the student must submit a satisfactory thesis at the end of two semesters of research. A total of four units must be taken. The units must be distributed between the two semesters (2 units in E195A and 2 units in E195B, or 1+3 or 3+1). Note, completion of a senior thesis does not contribute toward graduation requirements.
Engineering Science Senior Thesis Research: Read More [+]

Objectives & Outcomes

Course Objectives: Gain experience conducting an independent research project in science and/or engineering.
Report research outcomes in a written thesis.

Student Learning Outcomes: Develop familiarity reading scientific literature
Gain expertise in a field closely related to their coursework
Gain practice asking research questions and managing an independent project
Learn how to communicate scientific ideas and methods in a research thesis
Practice good teamwork with their fellow research students and their supervisor

Rules & Requirements

Prerequisites: ENGIN 195A

Hours & Format

Fall and/or spring: 15 weeks - 3-9 hours of independent study per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Engineering Science Senior Thesis Research: Read Less [-]

ENGIN 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Fall 2024, Summer 2024 First 6 Week Session, Spring 2024
Group study of selected topics.
Directed Group Studies for Advanced Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Upper division standing, plus particular courses to be specified by instructor

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

Hours & Format

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

Summer: 8 weeks - 1.5-7.5 hours of directed group study per week

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

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