

Engineering Mathematics and Statistics

Bachelor of Science (BS)

The Engineering Mathematics and Statistics major offered through the Engineering Science Program offers students an opportunity to study pure and applied mathematics as essential components of modern engineering. By combining courses for pure mathematics, applied mathematics, statistics, the physical sciences, and engineering, a student may individualize a program of study, of theory, or of applications of both. It provides a broad foundation for graduate studies in theoretical branches of engineering, as well as in mathematics, and can prepare students for a career in specific sectors of industry or business.

Admission to the Major

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

Admission to Engineering via a Change of College application for current UC Berkeley students is highly unlikely and very competitive as there few, if any, spaces that open in the College 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

There is no minor program in Engineering Mathematics and Statistics.

Other Majors offered by the Engineering Science Program

Energy Engineering (<http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/energy-engineering>)

Engineering Physics (<http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/engineering-physics>)

Environmental Engineering Science (<http://guide.berkeley.edu/archive/2014-15/undergraduate/degree-programs/environmental-engineering-science>)

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

General Guidelines

1. All technical courses (courses in engineering, mathematics, chemistry, physics, statistics, biological sciences, and computer science) 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

Select one of the following:

CHEM 1A	General Chemistry	
CHEM 4A	General Chemistry and Quantitative Analysis	
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
PHYSICS 7C	Physics for Scientists and Engineers	4
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4

or COMPSCI 61A The Structure and Interpretation of Computer Programs

ENGIN 177	Advanced Programming with MATLAB	3
or COMPSCI 61B	Data Structures	
or COMPSCI 61B	Data Structures and Programming Methodology	

Lower-division Technical Electives:

Select two from the following:

COMPSCI 61A	The Structure and Interpretation of Computer Programs ²	
COMPSCI 61B	Data Structures ²	
COMPSCI 61B	Data Structures and Programming Methodology ²	
COMPSCI 61C	Machine Structures	
COMPSCI 61C	Machine Structures (Lab-Centric)	
ENGIN 26 & ENGIN 27	Three-Dimensional Modeling for Design and Introduction to Manufacturing and Tolerancing	
ENGIN 28	Basic Engineering Design Graphics	
ENGIN 45	Properties of Materials	
MATH 55	Discrete Mathematics	
MEC ENG C85	Introduction to Solid Mechanics	

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

² This course may only be used as a lower-division Technical Elective if not being used to satisfy other requirements above.

Upper-division Requirements

Because of the interdisciplinary nature of this major, electives must be selected and approved in consultation with a faculty adviser.

In addition to the requirements listed below, students may choose up to 6-8 units of Free Electives, in order to meet the 120 units required for graduation. Free electives can be any technical or non-technical course of the student's interest, offered by any department at UC Berkeley, with no restrictions.

MATH 110	Linear Algebra	4
MATH 104	Introduction to Analysis	4
MATH 105	Second Course in Analysis	4
or MATH 185	Introduction to Complex Analysis	
MATH 128A	Numerical Analysis	4
STAT 134	Concepts of Probability	3
Select three Math/Statistics Electives:		
Select one course in Mathematics, one course in Statistics, and one course from either, from the following:		
MATH 105	Second Course in Analysis	
MATH 113	Introduction to Abstract Algebra	
MATH 118	Fourier Analysis, Wavelets, and Signal Processing	
MATH 123	Ordinary Differential Equations	
MATH 125A	Mathematical Logic	
MATH 126	Introduction to Partial Differential Equations	
MATH 130	The Classical Geometries	
MATH 135	Introduction to the Theory of Sets	
MATH 140	Metric Differential Geometry	
MATH 142	Elementary Algebraic Topology	
MATH 170	Mathematical Methods for Optimization	
MATH 185	Introduction to Complex Analysis	
MATH 189	Mathematical Methods in Classical and Quantum Mechanics	
ENGIN 117	Methods of Engineering Analysis (counts as a Math Elective)	
STAT 135	Concepts of Statistics	
STAT 150	Stochastic Processes	
STAT 151A	Linear Modelling: Theory and Applications	
STAT 151B	Linear Modelling: Theory and Applications	
STAT 152	Sampling Surveys	
STAT 153	Introduction to Time Series	
STAT 154	Modern Statistical Prediction and Machine Learning	
STAT 157	Seminar on Topics in Probability and Statistics	
STAT 158	The Design and Analysis of Experiments	

Upper-division Technical Electives: Select 16 units of upper-division Engineering courses, in consultation with faculty adviser^{1, 2}

¹ Technical electives must include 16 units of upper-division Engineering courses, selected in consultation with the student's faculty adviser, in order to provide depth in an area of engineering with high mathematical content—typically, most of these courses will come from a single Engineering department, but courses that complement each other from different departments are also permissible.

² IND ENG 172 cannot be used to fulfill this requirement.

Students in the College of Engineering must complete 120 semester units with the following provisions:

1. Completion of the requirements of one Engineering major program (<http://coe.berkeley.edu/students/guide/departments>) of study.
2. A minimum overall grade point average of 2.000 (C average) and a minimum 2.000 grade point average in upper division technical course work required of the major.
3. The final 30 units must be completed in residence in the College of Engineering on the Berkeley campus in two consecutive semesters.
4. All technical courses (math, science & engineering), required of the major or not, must be taken on a letter graded basis (unless they are only offered P/NP).
5. Entering freshman are allowed a maximum of eight semesters to complete their degree requirements. Entering junior transfers are allowed a maximum of four 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.

Humanities and Social Science Requirement

To promote a rich and varied educational experience outside of the technical requirements for each major, the College of Engineering has a Humanities and Social Sciences breadth requirement, which must be completed to graduate. This requirement is built into all the Engineering programs of study. The requirement includes two approved reading and composition courses and four additional approved courses, within which a number of specific conditions must be satisfied.

1. Complete a minimum of six courses (3 units or more) from the approved Humanities/Social Sciences (H/SS) lists (<http://coe.berkeley.edu/hssreq>).
2. Two of the six courses must fulfill the Reading and Composition Requirement. These 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. For detailed lists of courses that fulfill Reading and Composition requirements, please see the Reading and Composition page (<http://guide.berkeley.edu/archive/2014-15/undergraduate/colleges-schools/engineering/reading-composition-requirement>) in this bulletin.
3. The four additional courses must be chosen from the H/SS comprehensive list. These courses may be taken on a Pass/Not Passed Basis (P/NP).
4. At least two of the six courses must be upper division (courses numbered 100-196).
5. At least two courses must be from the same department and at least one of the two must be upper division. This is called the *Series requirement. AP tests can be combined with a course to complete the series requirement. For example, AP History (any) combined with an upper division History course would satisfy the series requirement
6. One of the six courses must satisfy the campus American Cultures Requirement. For detailed lists of courses that fulfill American Cultures requirements, please see the American Cultures page (<http://>

guide.berkeley.edu/archive/2014-15/undergraduate/colleges-schools/engineering/american-cultures-requirement) in this bulletin.

7. A maximum of two exams (Advanced Placement, International Baccalaureate, or A-Level) may be used toward completion of the H/SS requirement. Visit this link (<http://coe.berkeley.edu/exams>)

8. No courses offered by an Engineering department (IEOR, CE, etc.) other than BIOE 100, CS C79, ENGIN 125, ENGIN 130AC, 157AC, ME 191K and ME 191AC may be used to complete H/SS requirements.

9. Courses may fulfill multiple categories. For example, if you complete City and Regional Planning 115 and 118AC that would satisfy the series requirement, the two upper division courses requirement and the American Cultures Requirement.

10. The College of Engineering (COE) uses modified versions of five of the College of Letters and Science (L&S) breadth requirements lists to provide options to our students for completing the Humanities and Social Science requirement. Our requirement is different than that of L & S, so the guidelines posted on the top of each L & S breadth list do NOT apply to COE students.

11. Foreign language courses MAY be used to complete H/SS requirements. L & S does not allow students to use many language courses, so their lists will not include all options open to Engineering students. For a list of language options, visit <http://coe.berkeley.edu/FL>

*NOTE: for the Series Requirement: The purpose of the series requirement is to provide depth of knowledge in a certain area. Therefore, a two-course sequence not in the same department may be approved by petition, in cases in which there is a clear and logical connection between the courses involved.

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

Freshman				
	Fall	Units	Spring	Units
Chemistry: CHEM 1A & CHEM 1AL or CHEM 4A		4	PHYSICS 7A	4
MATH 1A		4	ENGIN 7 or COMPSCI 61A	4
Reading & Composition course from List A		4	MATH 1B	4
Humanities/Social Sciences course		3-4	Lower- division Technical Elective	3-4
		15-16		15-16
Sophomore				
	Fall	Units	Spring	Units
MATH 53		4	MATH 54	4
Lower-division Technical Elective		3-4	PHYSICS 7C	4
PHYSICS 7B		4	ENGIN 177, COMPSCI 61B, or COMPSCI 61BL	3
Reading & Composition course from List B		4	Humanities/ Social Sciences course	3-4
		15-16		14-15

Junior				
	Fall	Units	Spring	Units
MATH 110		4	MATH 105 or 185	4
STAT 134		3	MATH 128A	4
Humanities/Social Science course		3-4	Upper- division Technical Elective ¹	4
MATH 104		4	Humanities/ Social Science course	3-4
		14-15		15-16
Senior				
	Fall	Units	Spring	Units
Upper-division Technical Electives ¹		12	Upper- division Technical Electives ¹	12
Free Electives		3-4	Free Electives	3-4
		15-16		15-16

Total Units: 118-126

¹ The Technical Electives listed here include the upper-division Math/Statistics Electives; they can be taken during any of the terms for which Technical Electives are listed.

Engineering Mathematics and Statistics

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

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.

Rules & Requirements

Prerequisites: Mathematics 1B (maybe 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

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

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.

Rules & Requirements

Prerequisites: Mathematics 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 - 1 hour of discussion, 4 hours of laboratory, and 2 hours of lecture per week

Summer: 10 weeks - 6 hours of web-based lecture 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

ENGIN 10 Engineering Design and Analysis 3 Units

This is an introduction to the profession of engineering and its different disciplines through a variety of individual design and analysis projects. Hands on creativity, teamwork, and effective communication are emphasized. Common lecture sessions address the essence of engineering design, the practice of engineering analysis, the societal context for engineering projects and the ethics of the engineering profession. Students develop design and analysis skills, and practice applying these skills to illustrative problems drawn from various mechanical engineering topics such as material testing, aerodynamics, controls and design.

Objectives & Outcomes

Course Objectives: Develop teamwork skills.

Emphasize communication skills, both written and oral.

Enhance students critical thinking and design skills.

Introduce students to a broad view of engineering analysis and design.

Introduce students to professional ethics and the societal context of engineering practice.

Offer experience in hands on, creative engineering projects.

Provide an introduction to different fields of engineering.

Reinforce the importance of mathematics and science in engineering design and analysis.

The objectives of the course are to: enhance

critical thinking and design skills; introduce students to a broad view

of engineering analysis and design; reinforce the importance of

mathematics and science in engineering design and analysis; emphasize

communication skills, both written and oral; develop teamwork skills; offer

experience in hands on, creative engineering projects; provide an

introduction to different fields of engineering; and introduce students to

professional ethics and the societal context of engineering practice.

Student Learning Outcomes: Appreciate the importance of professional and ethical responsibility in engineering.

Begin to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Begin to use the techniques, skills, and engineering tools necessary for contemporary and future engineering practice.

Develop early abilities identifying, formulating, and solving engineering problems.

Gain experience in working in multidisciplinary teams.

Obtain experience in effective communication.

Recognize the role of mathematics and science in engineering.

Understand the design of systems, components, and processes to meet

desired needs within realistic constraints. Through active participation in

this course, students will: begin to recognize the role of mathematics and

science in engineering; understand the design of systems, components,

and processes to meet desired needs within realistic constraints; gain

experience in working in multi-

disciplinary teams; develop early abilities in identifying, formulating, and

solving engineering problems; appreciate the importance of professional

and ethical responsibility in engineering; obtain experience in effective

communication; begin to understand the impact of engineering solutions

in a global, economic, environmental, and societal context; and begin

to use the techniques, skills, and engineering tools necessary for

contemporary and future engineering practice.

Hours & Format

Fall and/or spring: 15 weeks - 3 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.

ENGIN 10 Engineering Design and Analysis 3 Units

This is an introduction to the profession of engineering and its different disciplines through a variety of individual design and analysis projects. Hands on creativity, teamwork, and effective communication are emphasized. Common lecture sessions address the essence of engineering design, the practice of engineering analysis, the societal context for engineering projects and the ethics of the engineering profession. Students develop design and analysis skills, and practice applying these skills to illustrative problems drawn from various mechanical engineering topics such as material testing, aerodynamics, controls and design.

Objectives & Outcomes

Course Objectives: Develop teamwork skills.

Emphasize communication skills, both written and oral.

Enhance students critical thinking and design skills.

Introduce students to a broad view of engineering analysis and design.

Introduce students to professional ethics and the societal context of engineering practice.

Offer experience in hands on, creative engineering projects.

Provide an introduction to different fields of engineering.

Reinforce the importance of mathematics and science in engineering design and analysis. The objectives of the course are to: enhance critical thinking and design skills; introduce students to a broad view of engineering analysis and design; reinforce the importance of mathematics and science in engineering design and analysis; emphasize communication skills, both written and oral; develop teamwork skills; offer experience in hands on, creative engineering projects; provide an introduction to different fields of engineering; and introduce students to professional ethics and the societal context of engineering practice.

Student Learning Outcomes: Appreciate the importance of professional and ethical responsibility in engineering.

Begin to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Begin to use the techniques, skills, and engineering tools necessary for contemporary and future engineering practice.

Develop early abilities identifying, formulating, and solving engineering problems.

Gain experience in working in multidisciplinary teams.

Obtain experience in effective communication.

Recognize the role of mathematics and science in engineering.

Understand the design of systems, components, and processes to meet desired needs within realistic constraints. Through active participation in this course, students will: begin to recognize the role of mathematics and science in engineering; understand the design of systems, components, and processes to meet desired needs within realistic constraints; gain experience in working in multidisciplinary teams; develop early abilities in identifying, formulating, and solving engineering problems; appreciate the importance of professional and ethical responsibility in engineering; obtain experience in effective communication; begin to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and begin to use the techniques, skills, and engineering tools necessary for contemporary and future engineering practice.

Hours & Format

Fall and/or spring: 15 weeks - 3 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.

ENGIN 15 Design Methodology 2 Units

Introduction to design methodology, problem definition, and the search for creative solutions. Social, political, legal, and ethical aspects of design solutions. Topics and discussions include the structure of engineering organizations, the product development cycle, mechanical dissection, reverse engineering, patents, failure case studies, product liability, and engineering ethics.

Objectives & Outcomes

Course Objectives: To introduce the engineering design process, its scope, and its limitations. To have students understand the responsibilities of an engineer for designs that are created.

Student Learning Outcomes: The ability to use methodical techniques to identify engineering problems and develop practical solutions. The ability to work effectively in a team environment.

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.

Instructor: Lieu

ENGIN 24 Freshman Seminar 1 Unit

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.

Rules & Requirements

Repeat rules: Course may be repeated for credit as topic varies. 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.

ENGIN 25 Visualization for Design 2 Units

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.

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.

Rules & Requirements

Credit Restrictions: Students will receive no credit for Engineering 25 after completing both Engineering 10 and 28.

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

ENGIN 26 Three-Dimensional Modeling for Design 2 Units

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 is required. Hands-on creativity, teamwork, and effective communication are emphasized.

Objectives & Outcomes

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

Student Learning Outcomes: Upon completion of the course, students shall be able to operate 3-dimensional solid modeling software tools with a high degree of skill and confidence; specify dimensions for parts and assemblies such that they can be fabricated, and fit such that they function with the desired result; produce rapid-prototype models of parts and assemblies to demonstrate their desired functionality; understand the design of systems, components, and processes to meet desired needs within realistic constraints.

Rules & Requirements

Prerequisites: None

Credit Restrictions: Students will receive no credit for Engineering 26 after completing Engineering 10 and 28.

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, Youssefi

ENGIN 27 Introduction to Manufacturing and Tolerancing 2 Units
Geometric dimensioning and tolerancing (GD&T), tolerance analysis for fabrication, fundamentals of manufacturing processes (metal cutting, welding, joining, casting, molding, and layered manufacturing).

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: Engineering 25 (can be taken concurrently)

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. Final exam required.

Instructors: McMains, Lieu, Dornfeld, Taylor

ENGIN 28 Basic Engineering Design Graphics 3 Units
Introduction to the engineering design process and graphical communications tools used by engineers. Conceptual design of products. Tolerance analysis for fabrication. Documentation of design through engineering drawing. Development of spatial reasoning skills. Basic descriptive geometry. Parametric solid modeling and feature based design. Use of Computer-Assisted Design as a design tool.

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 required.

Instructor: Lieu

ENGIN 39B Freshman/Sophomore Seminar 1.5 - 4 Units

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.

Rules & Requirements

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

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.

ENGIN 39E Freshman/Sophomore Seminar 1.5 - 4 Units

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.

Rules & Requirements

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

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.

ENGIN 39F Freshman/Sophomore Seminar 1.5 - 4 Units

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.

Rules & Requirements

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

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.

ENGIN 45 Properties of Materials 3 Units

Application of basic principles of physics and chemistry to the engineering properties of materials. Special emphasis devoted to relation between microstructure and the mechanical properties of metals, concrete, polymers, and ceramics, and the electrical properties of semiconducting materials. Sponsoring Department: Materials Science and Engineering

Rules & Requirements

Prerequisites: PHYSICS 7A

Hours & Format

Fall and/or spring: 15 weeks - 3 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.

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

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.

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. Course may be repeated for credit when topic changes.

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.

ENGIN 92 Perspectives in Engineering 1 Unit

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.

Rules & Requirements

Repeat rules: Course may be repeated for credit. 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: Offered for pass/not pass grade only. Final exam not required.

ENGIN 93 Energy Engineering Seminar 1 Unit

Weekly seminar with different speakers on energy-related topics. The goal is to expose students to a broad range of energy issues.

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

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

Seminars for group study of selected topics, which will vary from year to year. Intended for students in the lower division.

Rules & Requirements

Prerequisites: Consent of instructor

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

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.

ENGIN 115 Engineering Thermodynamics 4 Units

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.

Rules & Requirements

Prerequisites: PHYSICS 7B, MATH 54; Chemistry 1B recommended

Credit Restrictions: Students will receive no credit for Engineering 115 after taking Mechanical Engineering 105 or Chemical Engineering 141.

Hours & Format

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

Additional Details

Subject/Course Level: Engineering/Undergraduate

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

Instructors: Glaeser, Olander

ENGIN 117 Methods of Engineering Analysis 3 Units

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.

Rules & Requirements

Prerequisites: Mathematics 53, 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.

ENGIN 120 Principles of Engineering Economics 3 Units

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.

Rules & Requirements

Prerequisites: Completion of 60 units of an approved engineering curriculum

Credit Restrictions: Students will receive 2 units for 120 after taking Civil Engineering 167.

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

ENGIN 125 Ethics, Engineering, and Society 3 Units

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).

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.

ENGIN 128 Advanced Engineering Design Graphics 3 Units
Advanced graphics tools for engineering design. Parametric solid modeling. Assembly modeling. Presentation using computer animation and multimedia techniques.

Rules & Requirements

Prerequisites: 28

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

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

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.

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. Course may be repeated for credit when topic changes.

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.

ENGIN 157AC Engineering, The Environment, and Society 4 Units
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 or unit requirements.

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

ENGIN 177 Advanced Programming with MATLAB 3 Units

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.

Rules & Requirements

Prerequisites: 7 or 77; Mathematics 53 and 54 (one of these 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

ENGIN 194 Undergraduate Research 3 Units

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.

Rules & Requirements

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

Repeat rules: Course may be repeated for credit, but only three units may be used to satisfy a technical elective. Course may be repeated for credit when topic changes.

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.

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

Group study of selected topics.

Rules & Requirements

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

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

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.