

Electrical Engineering and Computer Sciences/ Nuclear Engineering Joint Major

Bachelor of Science (BS)

The joint major programs are designed for students who wish to undertake study in two areas of engineering in order to qualify for employment in either field or for positions in which competence in two fields is required. These curricula include the core courses in each of the major fields. While they require slightly increased course loads, they can be completed in four years.

The electrical engineering and computer sciences (EECS)/nuclear engineering (NE) joint major combines the traditional electrical engineering (EE) program with one in the nuclear sciences. Nuclear engineering shares with electrical engineering a concern for electrical power generation, automatic control, computer sciences, and plasmas.

Admission to the Joint Major

Admission directly to a joint major is closed to freshmen and junior transfer applicants. Students interested in a joint program may apply to change majors during specific times in their academic progress. Please see the College of Engineering joint majors website (<http://engineering.berkeley.edu/academics/majors-minors/joint-majors>) for complete details.

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 (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 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	4
or 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 45 & 45L	Properties of Materials and Properties of Materials Laboratory	4
EL ENG 16A	Designing Information Devices and Systems I	4
EL ENG 16B	Designing Information Devices and Systems II	4
COMPSCI 61A	The Structure and Interpretation of Computer Programs	4
or ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	
COMPSCI 61B	Data Structures	4
or COMPSCI 61BID	Data Structures and Programming Methodology	
NUC ENG 24	Freshman Seminars	1

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

Upper Division Requirements

NUC ENG 100	Introduction to Nuclear Engineering	3
NUC ENG 101	Nuclear Reactions and Radiation	4
NUC ENG 104	Radiation Detection and Nuclear Instrumentation Laboratory	4
NUC ENG 150	Introduction to Nuclear Reactor Theory	4
NUC ENG 170A	Nuclear Design: Design in Nuclear Power Technology and Instrumentation	3
ENGIN 115	Engineering Thermodynamics	4
EL ENG 105	Microelectronic Devices and Circuits	4
EL ENG 117	Electromagnetic Fields and Waves	4
EL ENG 120	Signals and Systems	4
STAT 134	Concepts of Probability	3-4
or EL ENG 126	Probability and Random Processes	
Ethics Requirement ¹		3-4
NUC ENG upper division Technical Electives: Select 9 units in consultation with faculty adviser (see below).		9
EECS upper division Technical Electives: Select 8 units in consultation with faculty adviser (see below).		8

¹ Students must take one course with ethics content. This may be fulfilled within the humanities/social sciences requirement by taking one of the following courses: ANTHRO 156B, BIO ENG 100, ENGIN 125, ENGIN 157AC, ESPM 161, ESPM 162, GEOG 31, IAS 157AC, ISF 100E, L & S 160B, MEC ENG 191AC, PHILOS 2, PHILOS 104, PHILOS 107, PB HLTH 116, SOCIOL 116.

Nuclear Engineering Technical Electives

Students must complete at least 9 units of upper division nuclear engineering courses from the following groups. The groups are presented to aid undergraduate students in focusing their choices on specific professional goals; however, the electives selected need not be from any single group. Courses listed from other departments in these groups may be taken to provide further depth but may not be used toward the 9 units.

Beam and Accelerator Applications

PHYSICS 110A	Electromagnetism and Optics	4
PHYSICS 110B	Electromagnetism and Optics	4
PHYSICS 129	Particle Physics	4
PHYSICS 139	Special Relativity and General Relativity	3
PHYSICS 142	Introduction to Plasma Physics	4
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 180	Introduction to Controlled Fusion	3

Bionuclear Engineering

BIO ENG C165	Medical Imaging Signals and Systems	4
EL ENG 120	Signals and Systems	4
NUC ENG 107	Introduction to Imaging	3
NUC ENG 162	Radiation Biophysics and Dosimetry	3

Fission Power Engineering

MEC ENG 106	Fluid Mechanics	3-4
or CHM ENG 150A	Transport Processes	
MEC ENG 109	Heat Transfer	3-4
or CHM ENG 150	Transport Processes	
NUC ENG 120	Nuclear Materials	4
NUC ENG 124	Radioactive Waste Management	3
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 161	Nuclear Power Engineering	4
NUC ENG 167	Risk-Informed Design for Advanced Nuclear Systems	3
NUC ENG 175	Methods of Risk Analysis	3

Fusion Power Engineering

PHYSICS 110A	Electromagnetism and Optics	4
PHYSICS 110B	Electromagnetism and Optics	4
PHYSICS 142	Introduction to Plasma Physics	4
NUC ENG 120	Nuclear Materials	4
NUC ENG 180	Introduction to Controlled Fusion	3
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3

Homeland Security and Nonproliferation

CHEM 143	Nuclear Chemistry	2
PHYSICS 110A	Electromagnetism and Optics	4
PHYSICS 110B	Electromagnetism and Optics	4
PHYSICS 111A	Instrumentation Laboratory	3
PHYSICS 111B	Advanced Experimentation Laboratory	1-3
NUC ENG 107	Introduction to Imaging	3
NUC ENG 130	Analytical Methods for Non-proliferation	4
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 175	Methods of Risk Analysis	3

Materials in Nuclear Technology

MAT SCI 102	Bonding, Crystallography, and Crystal Defects	3
MAT SCI 104	Materials Characterization	4
MAT SCI 112	Corrosion (Chemical Properties)	3
MAT SCI 113	Mechanical Behavior of Engineering Materials	3
NUC ENG 120	Nuclear Materials	4
NUC ENG 124	Radioactive Waste Management	3

NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
-------------	--	---

NUC ENG 161	Nuclear Power Engineering	4
-------------	---------------------------	---

Nuclear Fuel Cycles and Waste Management

CHM ENG 150A	Transport Processes	4
CHM ENG 150B	Transport and Separation Processes	4
ENGIN 120	Principles of Engineering Economics	3
MAT SCI 112	Corrosion (Chemical Properties)	3
NUC ENG 120	Nuclear Materials	4
NUC ENG 124	Radioactive Waste Management	3
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 161	Nuclear Power Engineering	4
NUC ENG 175	Methods of Risk Analysis	3

Radiation and Health Physics

NUC ENG 120	Nuclear Materials	4
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 162	Radiation Biophysics and Dosimetry	3
NUC ENG 180	Introduction to Controlled Fusion	3

Risk, Safety and Systems Analysis

CIV ENG 193	Engineering Risk Analysis	3
CHM ENG 150A	Transport Processes	4
ENGIN 120	Principles of Engineering Economics	3
IND ENG 166	Decision Analytics	3
NUC ENG 120	Nuclear Materials	4
NUC ENG 124	Radioactive Waste Management	3
NUC ENG 155	Introduction to Numerical Simulations in Radiation Transport	3
NUC ENG 161	Nuclear Power Engineering	4
NUC ENG 167	Risk-Informed Design for Advanced Nuclear Systems	3
NUC ENG 175	Methods of Risk Analysis	3

Electrical Engineering Technical Electives

Students must complete at least 8 units of upper division electrical engineering courses from the following groups:

Electromagnetics and Plasmas

EL ENG 118	Introduction to Optical Engineering	3
EL ENG C239	Partially Ionized Plasmas	3

Electronics

EL ENG 130	Integrated-Circuit Devices	4
EL ENG 140	Linear Integrated Circuits	4
EL ENG 143	Microfabrication Technology	4
EECS 151 & 151LA	Introduction to Digital Design and Integrated Circuits and Application Specific Integrated Circuits Laboratory	5
or EECS 151 & 151LB	Introduction to Digital Design and Integrated Circuits and Field-Programmable Gate Array Laboratory	

Power Systems and Control

EL ENG 113	Power Electronics	4
EL ENG C128	Feedback Control Systems	4

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

This program is geared toward students who would like to pursue an education beyond the BS/BA, allowing them to achieve greater breadth and/or depth of knowledge, and who would like to try their hand at research as well. It is not intended for students who have definitely decided to pursue a PhD immediately following graduation. Those students are advised to apply for a PhD program at Berkeley or elsewhere during their senior year. Students who have been accepted into the five-year BA/MS or BS/MS are free to change their minds later and apply to enter the PhD program or apply to a PhD program at another university. Note that admission is competitive with all our PhD applicants.

The program is focused on interdisciplinary training at a graduate level; with at least 8 units of course work outside EECS required. Students will emerge as leaders in their technical and professional fields.

- Focused on interdisciplinary study and more experience in aligned technical fields such as physics, materials science, statistics, biology, etc., and/or professional disciplines such as management of technology, business, law and public policy.
- If admitted to the program, students must begin the graduate portion in the semester immediately following the conferral of the bachelor's degree.
- Only one additional year (two semesters) is permitted beyond the bachelor's degree.
- Only available to Berkeley EECS and L&S CS undergraduates.
- Participants in program may serve as graduate student instructors with approval from their faculty research adviser and the 5th Year MS Committee.
- Participants in program are self-funded.

For further information regarding this program, please see the department's website (<http://www.eecs.berkeley.edu/FiveYearMS>)

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 (<http://coe.berkeley.edu/students/guide/departments>) 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), required of the major or not, 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 a maximum of four semesters to complete their degree requirements. (Note: junior transfers admitted missing three or more courses from the lower division curriculum are allowed five semesters.) 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 (<http://engineering.berkeley.edu/academics/undergraduate-guide>) as they complete degree requirements.
7. Complete the lower division program before enrolling in upper division engineering courses.

Humanities and Social Science (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. Follow these guidelines to fulfill this requirement:

1. Complete a minimum of six courses from the approved Humanities/Social Sciences (H/SS) lists (<http://coe.berkeley.edu/hssreq>).
2. Courses must be a minimum of 3 semester units (or 4 quarter units).
3. Two of the six courses must fulfill the college's Reading and Composition (R&C) 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 (fourth 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, must be completed by no later than the end of the sophomore year. View a detailed lists of courses (<http://ls-advise.berkeley.edu/requirement/rccourses.html>) that fulfill Reading and Composition requirements, or use the College of Letters and Sciences search engine (<http://ls-breadth.berkeley.edu>) to view R&C courses offered in a given semester.
4. The four additional courses must be chosen within College of Engineering guidelines from the H/SS lists (see below). These courses may be taken on a Pass/Not Passed basis (P/NP).
5. Two of the six courses must be upper division (courses numbered 100-196).
6. One of the six courses must satisfy the campus American Cultures requirement. For detailed lists of courses that fulfill American Cultures requirements, visit the American Cultures (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/engineering/american-cultures-requirement>) site.
7. A maximum of two exams (Advanced Placement, International Baccalaureate, or A-Level) may be used toward completion of the H/SS requirement. View the list of exams (<http://engineering.berkeley.edu/academics/undergraduate-guide/exams-ap-ib-level-and-transfer-credit-information>) that can be applied toward H/SS requirements.
8. Courses may fulfill multiple categories. For example, if you complete CY PLAN 118AC (<http://guide.berkeley.edu/search/?P=CY%20PLAN%20118AC>) that would satisfy the American Cultures requirement and one upper division H/SS requirement.
9. No courses offered by any engineering department other than BIO ENG 100 (<http://guide.berkeley.edu/search/?P=BIO%20ENG%20100>), COMPSCI C79 (<http://guide.berkeley.edu/search/?P=COMPSCI%20C79>), ENGIN 125 (<http://guide.berkeley.edu/search/?P=ENGIN%20125>), ENGIN 157AC (<http://guide.berkeley.edu/search/?P=ENGIN%20157AC>), MEC ENG 191K (<http://guide.berkeley.edu/search/?P=MEC%20ENG>

%20191K) and MEC ENG 191AC (<http://guide.berkeley.edu/search/?P=MEC%20ENG%20191AC>) may be used to complete H/SS requirements.

10. Foreign language courses may be used to complete H/SS requirements. View the list of language options (<http://ls-advise.berkeley.edu/requirement/fl.html>) .
11. Courses numbered 97, 98, 99, or above 196 may not be used to complete any H/SS requirement
12. The College of Engineering 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 H/SS requirement. No courses on the L&S Biological Sciences or Physical Sciences breadth lists may be used to complete H/SS requirements. Within the guidelines above, choose courses from any of the lists below.
 - Arts and Literature (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-arts-literature>)
 - Foreign Language (<http://ls-advise.berkeley.edu/requirement/fl.html>)
 - Historical Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-historical-studies>)
 - International Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-international-studies>)
 - Philosophy and Values (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-philosophy-values>)
 - Social and Behavioral Studies (<http://guide.berkeley.edu/archive/2016-17/undergraduate/colleges-schools/letters-science/breadth-requirement-social-behavioral-sciences>)

Class Schedule Requirements

- Minimum units per semester: 12.0.
- Maximum units per semester: 20.5.
- Minimum technical courses: College of Engineering undergraduates must enroll each semester in no fewer than two technical courses (of a minimum of 3 units each) required of the major program of study in which the student is officially declared. (Note: for most majors, normal progress will require enrolling in 3-4 technical courses each semester).
- All technical courses (math, science, engineering), required of the major or not, must be taken on a letter graded basis (unless only offered as P/NP).
- A student's proposed schedule must be approved by a faculty adviser (or on approval from the dean or a designated staff adviser) each semester prior to enrolling in courses.

Minimum Academic (Grade) Requirements

- A minimum overall and semester grade point average of 2.00 (C average) is required of engineering undergraduates. A student 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 of the major curriculum each semester. A student will be subject to dismissal from

the University if their upper division technical grade point average falls below 2.00.

- A minimum overall grade point average of 2.00, and a minimum 2.00 grade point average in upper division technical course work required of the major is needed to earn a Bachelor of Science in Engineering.

Unit Requirements

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

- Completion of the requirements of one engineering major program (<http://coe.berkeley.edu/students/guide/departments>) of study.
- A maximum of 16 units of special studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of physical education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/ NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation.

Normal Progress

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

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
CHEM 4A or 1A and 1AL		4	MATH 1B	4
MATH 1A		4	COMPSI 61E or 61BL	4
COMPSI 61A or ENGIN 7		4	PHYSICS 7A	4
NUC ENG 24		1	Reading & Composition course from List B	4
Reading & Composition course from List A		4		
		17		16
Sophomore				
	Fall	Units	Spring	Units
ENGIN 45 & 45L		4	EL ENG 16B	4
EL ENG 16A		4	MATH 54	4
MATH 53		4	PHYSICS 7C	4
PHYSICS 7B		4	NUC ENG 10C	3
		16		15
Junior				
	Fall	Units	Spring	Units
ENGIN 115		4	NUC ENG 104	4
NUC ENG 101		4	NUC ENG 15C	4
EL ENG 120		4	STAT 134 or EL ENG 126	3-4

Humanities/Social Sciences course with Ethics content ¹	3-4 Humanities/Social Sciences course	3-4
	15-16	14-16
		Senior
	Fall	Units
EL ENG 105	4 EL ENG 117	4
Technical Electives ²	9 NUC ENG 17C	3
Humanities/Social Sciences course	3-4 Technical Electives ²	8
	Humanities/Social Sciences course	3-4
	16-17	18-19
Total Units: 127-132		

¹ Students must take one course with ethics content. This may be fulfilled within the humanities/social sciences requirement by taking one of the following courses: ANTHRO 156B, BIO ENG 100, ENGIN 125, ENGIN 157AC, ESPM 161, ESPM 162, GEOG 31, IAS 157AC, ISF 100E, L & S 160B, MEC ENG 191AC, PHILOS 2, PHILOS 104, PHILOS 107, PB HLTH 116, SOCIOL 116.

² See Major Requirements tab for list of technical elective courses.

Select a subject to view courses

- Electrical Engineering and Computer Sciences (p.)
- Nuclear Engineering (p.)

Electrical Engineering and Computer Sciences EL ENG 16A Designing Information Devices and Systems I 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Summer 2017 8 Week Session

This course and its follow-on course EE16B focus on the fundamentals of designing modern information devices and systems that interface with the real world. Together, this course sequence provides a comprehensive foundation for core EECS topics in signal processing, learning, control, and circuit design while introducing key linear-algebraic concepts motivated by application contexts. Modeling is emphasized in a way that deepens mathematical maturity, and in both labs and homework, students will engage computationally, physically, and visually with the concepts being introduced in addition to traditional paper/pencil exercises. The courses are aimed at entering students as well as non-majors seeking a broad foundation for the field.

Designing Information Devices and Systems I: Read More [+]

Rules & Requirements

Prerequisites: Math 1A, Math 1B or equivalent (may be taken concurrently), CS 61A or equivalent (encouraged to be taken concurrently)

Credit Restrictions: Students will receive no credit for Electrical Engineering 16A after completing Electrical Engineering 20 or 40.

Hours & Format

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

Summer: 8 weeks - 6 hours of lecture, 4 hours of discussion, and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Alon, Arcak, Ayazifar, Maharbiz, Niknejad, Ranade, Sahai, Subramanian, Tomlin

Designing Information Devices and Systems I: Read Less [-]

EL ENG 16B Designing Information Devices and Systems II 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

This course is a follow-on to Electrical Engineering 16A, and focuses on the fundamentals of designing and building modern information devices and systems that interface with the real world. The course sequence provides a comprehensive introduction to core EECS topics in circuit design, signals, and systems in an application-driven context. The courses are delivered assuming mathematical maturity and aptitude at roughly the level of having completed Math 1A-1B, and are aimed at entering students as well as non-majors seeking a broad introduction to the field.

Designing Information Devices and Systems II: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Electrical Engineering 16A, Designing Information Devices and Systems I

Credit Restrictions: Students will receive no credit for Electrical Engineering 16B after completing Electrical Engineering 20 or 40.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Alon, Ayazifar, Lustig, Maharbiz, Subramanian, Tomlin

Designing Information Devices and Systems II: Read Less [\[-\]](#)

EL ENG 24 Freshman Seminar 1 Unit

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Spring 2017, Spring 2016

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

Freshman Seminar: Read More [\[+\]](#)

Hours & Format

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

Additional Details

Subject/Course Level: Electrical 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 [\[-\]](#)

EL ENG 25 What Electrical Engineers Do--Feedback from Recent Graduates 1 Unit

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2011

A Berkeley Electrical Engineering and Computer Sciences degree opens the door to many opportunities, but what exactly are they? Graduation is only a few years away and it's not too early to find out. In this seminar students will hear from practicing engineers who recently graduated.

What are they working on? Are they working in a team? What do they wish they had learned better? How did they find their jobs?

What Electrical Engineers Do--Feedback from Recent Graduates: Read More [\[+\]](#)

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Boser

What Electrical Engineers Do--Feedback from Recent Graduates: Read Less [\[-\]](#)

EL ENG 39 Freshman/Sophomore Seminar 2 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Fall 2016

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

Prerequisites: Priority given to freshmen and sophomores

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 - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Electrical 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 [\[-\]](#)

EL ENG 42 Introduction to Digital Electronics 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2013, Summer 2013 8 Week Session, Spring 2013

This course serves as an introduction to the principles of electrical engineering, starting from the basic concepts of voltage and current and circuit elements of resistors, capacitors, and inductors. Circuit analysis is taught using Kirchhoff's voltage and current laws with Thevenin and Norton equivalents. Operational amplifiers with feedback are introduced as basic building blocks for amplification and filtering. Semiconductor devices including diodes and MOSFETs and their IV characteristics are covered. Applications of diodes for rectification, and design of MOSFETs in common source amplifiers are taught. Digital logic gates and design using CMOS as well as simple flip-flops are introduced. Speed and scaling issues for CMOS are considered. The course includes as motivating examples designs of high level applications including logic circuits, amplifiers, power supplies, and communication links.

Introduction to Digital Electronics: Read More [+]

Rules & Requirements

Prerequisites: Mathematics 1B

Credit Restrictions: Students will receive no credit for 42 after taking 40 or 100.

Hours & Format

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

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Introduction to Digital Electronics: Read Less [-]

EL ENG 43 Introductory Electronics Laboratory 1 Unit

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2013, Summer 2013 8 Week Session, Spring 2013

Using and understanding electronics laboratory equipment such as oscilloscope, power supplies, function generator, multimeter, curve-tracer, and RLC-meter. Includes a term project of constructing and testing a robot or other appropriate electromechanical device.

Introductory Electronics Laboratory: Read More [+]

Rules & Requirements

Prerequisites: 42 (may be taken concurrently) or equivalent or consent of instructor

Hours & Format

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

Summer: 8 weeks - 3.5 hours of laboratory per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Introductory Electronics Laboratory: Read Less [-]

EL ENG 49 Electronics for the Internet of Things 4 Units

Offered through: Electrical Engin and Computer Sci
Terms offered: Spring 2018

Electronics has become pervasive in our lives as a powerful technology with applications in a wide range of fields including healthcare, environmental monitoring, robotics, or entertainment. This course teaches how to build electronic circuits that interact with the environment through sensors and actuators and how to communicate wirelessly with the internet to cooperate with other devices and with humans. In the laboratory students design and build representative samples such as solar harvesters, robots, that exchange information with or are controlled from the cloud.

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

Objectives Outcomes

Course Objectives: Electronics has become a powerful and ubiquitous technology supporting solutions to a wide range of applications in fields ranging from science, engineering, healthcare, environmental monitoring, transportation, to entertainment. The objective of this course is to teach students majoring in these and related subjects how to use electronic devices to solve problems in their areas of expertise.

Through the lecture and laboratory, students gain insight into the possibilities and limitations of the technology and how to use electronics to help solve problems. Students learn to use electronics to interact with the environment through sound, light, temperature, motion using sensors and actuators, and how to use electronic computation to orchestrate the interactions and exchange information wirelessly over the internet.

Student Learning Outcomes: Deploy electronic sensors and interface them to microcontrollers through digital and analog channels as well as common protocols (I2C, SPI),
Design, build and test electronic devices leveraging these concepts.
Interact with the internet and cloud services using protocols such as http, MQTT, Blynk,
Interface DC motors, steppers and servos to microcontrollers,
Represent information with voltage, current, power, and energy and how to measure these quantities with laboratory equipment,
To use and program low-cost and low-power microcontrollers for sensing, actuation, and information processing, and find and use program libraries supporting these tasks
Understand and make basic low-pass and high-pass filters, Wheatstone bridge etc.
Use electronics to sense and actuate physical parameters such as temperature, humidity, sound, light, and motion,

Rules & Requirements

Prerequisites: Engineering 7 or Computer Science 10 or equivalent background in computer programming (including Computer Science 61A, Data Science 8) Math 1a or equivalent background in Calculus

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Boser

Electronics for the Internet of Things: Read Less [-]

EL ENG 84 Sophomore Seminar 1 or 2 Units

Offered through: Electrical Engin and Computer Sci
Terms offered: Fall 2017, Spring 2016, Fall 2015

Sophomore seminars are small interactive courses offered by faculty members in departments all across the campus. Sophomore seminars offer opportunity for close, regular intellectual contact between faculty members and students in the crucial second year. The topics vary from department to department and semester to semester. Enrollment limited to 15 sophomores.

Sophomore Seminar: Read More [+]

Rules & Requirements

Prerequisites: At discretion of instructor

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:

5 weeks - 3-6 hours of seminar per week
10 weeks - 1.5-3 hours of seminar per week
15 weeks - 1-2 hours of seminar per week

Summer:

6 weeks - 2.5-5 hours of seminar per week
8 weeks - 1.5-3.5 hours of seminar per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Sophomore Seminar: Read Less [-]

EL ENG 97 Field Study 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Fall 2015, Spring 2015

Students take part in organized individual field sponsored programs with off-campus companies or tutoring/mentoring relevant to specific aspects and applications of computer science on or off campus. Note Summer CPT or OPT students: written report required. Course does not count toward major requirements, but will be counted in the cumulative units toward graduation.

Field Study: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Consent of instructor (see department adviser)

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Summer:

6 weeks - 2.5-10 hours of fieldwork per week

8 weeks - 2-7.5 hours of fieldwork per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Field Study: Read Less [\[-\]](#)

EL ENG 98 Directed Group Study for Undergraduates 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2016, Spring 2016, Fall 2015

Group study of selected topics in electrical engineering, usually relating to new developments.

Directed Group Study for Undergraduates: Read More [\[+\]](#)

Rules & Requirements

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Directed Group Study for Undergraduates: Read Less [\[-\]](#)

EL ENG 99 Individual Study and Research for Undergraduates 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Fall 2015, Spring 2015

Supervised independent study and research for students with fewer than 60 units completed.

Individual Study and Research for Undergraduates: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Freshman or sophomore standing and consent of instructor. Minimum GPA of 3.4 required

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

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Summer:

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Individual Study and Research for Undergraduates: Read Less [\[-\]](#)

EL ENG 105 Microelectronic Devices and Circuits 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

This course covers the fundamental circuit and device concepts needed to understand analog integrated circuits. After an overview of the basic properties of semiconductors, the p-n junction and MOS capacitors are described and the MOSFET is modeled as a large-signal device. Two port small-signal amplifiers and their realization using single stage and multistage CMOS building blocks are discussed. Sinusoidal steady-state signals are introduced and the techniques of phasor analysis are developed, including impedance and the magnitude and phase response of linear circuits. The frequency responses of single and multi-stage amplifiers are analyzed. Differential amplifiers are introduced.

Microelectronic Devices and Circuits: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: EE 16A & B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Microelectronic Devices and Circuits: Read Less [\[-\]](#)

EL ENG C106A Introduction to Robotics 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Fall 2015

An introduction to the kinematics, dynamics, and control of robot manipulators, robotic vision, and sensing. The course covers forward and inverse kinematics of serial chain manipulators, the manipulator Jacobian, force relations, dynamics, and control. It presents elementary principles on proximity, tactile, and force sensing, vision sensors, camera calibration, stereo construction, and motion detection. The course concludes with current applications of robotics in active perception, medical robotics, and other areas.

Introduction to Robotics: Read More [+]

Rules & Requirements

Prerequisites: EE 120 or equivalent, consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Bajcsy

Formerly known as: Electrical Engineering C125/Bioengineering C125

Also listed as: BIO ENG C125

Introduction to Robotics: Read Less [-]

EL ENG C106B Robotic Manipulation and Interaction 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2017, Spring 2016

This course is a sequel to Electrical Engineering C106A/Bioengineering C125, which covers kinematics, dynamics and control of a single robot. This course will cover dynamics and control of groups of robotic manipulators coordinating with each other and interacting with the environment. Concepts will include an introduction to grasping and the constrained manipulation, contacts and force control for interaction with the environment. We will also cover active perception guided manipulation, as well as the manipulation of non-rigid objects. Throughout, we will emphasize design and human-robot interactions, and applications to applications in manufacturing, service robotics, tele-surgery, and locomotion.

Robotic Manipulation and Interaction: Read More [+]

Rules & Requirements

Prerequisites: Electrical Engineering C106A/Bioengineering C125 or consent of the instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Bajcsy, Sastry

Also listed as: BIO ENG C125B

Robotic Manipulation and Interaction: Read Less [-]

EL ENG 113 Power Electronics 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

Power conversion circuits and techniques. Characterization and design of magnetic devices including transformers, reactors, and electromagnetic machinery. Characteristics of bipolar and MOS power semiconductor devices. Applications to motor control, switching power supplies, lighting, power systems, and other areas as appropriate.

Power Electronics: Read More [+]

Rules & Requirements

Prerequisites: 105 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Power Electronics: Read Less [-]

EL ENG 117 Electromagnetic Fields and Waves 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

Review of static electric and magnetic fields and applications; Maxwell's equations; transmission lines; propagation and reflection of plane waves; introduction to guided waves, microwave networks, and radiation and antennas. Minilabs on statics, transmission lines, and waves.

Electromagnetic Fields and Waves: [Read More](#) [+]

Rules & Requirements

Prerequisites: Electrical Engineering 16B, Mathematics 53, 54, Physics 7B, or equivalent that covers AC circuits and electromagnetics up to Maxwell's equations

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Electromagnetic Fields and Waves: [Read Less](#) [-]

EL ENG 118 Introduction to Optical Engineering 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Fall 2015

Fundamental principles of optical systems. Geometrical optics and aberration theory. Stops and apertures, prisms, and mirrors. Diffraction and interference. Optical materials and coatings. Radiometry and photometry. Basic optical devices and the human eye. The design of optical systems. Lasers, fiber optics, and holography.

Introduction to Optical Engineering: [Read More](#) [+]

Rules & Requirements

Prerequisites: Math 53, and EE 16AB or Math 54

Credit Restrictions: Students will receive no credit for Electrical Engineering 118 after taking Electrical Engineering 218A. A deficient grade in Electrical Engineering 119 may be removed by taking Electrical Engineering 118.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Waller

Introduction to Optical Engineering: [Read Less](#) [-]

EL ENG 120 Signals and Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

Continuous and discrete-time transform analysis techniques with illustrative applications. Linear and time-invariant systems, transfer functions. Fourier series, Fourier transform, Laplace and Z-transforms. Sampling and reconstruction. Solution of differential and difference equations using transforms. Frequency response, Bode plots, stability analysis. Illustrated by analysis of communication systems and feedback control systems.

Signals and Systems: [Read More](#) [+]

Rules & Requirements

Prerequisites: EE 16A and 16B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Signals and Systems: [Read Less](#) [-]

EL ENG 121 Introduction to Digital Communication Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Fall 2014, Fall 2013

Introduction to the basic principles of the design and analysis of modern digital communication systems. Topics include source coding, channel coding, baseband and passband modulation techniques, receiver design, and channel equalization. Applications to design of digital telephone modems, compact disks, and digital wireless communication systems. Concepts illustrated by a sequence of MATLAB exercises.

Introduction to Digital Communication Systems: [Read More](#) [+]

Rules & Requirements

Prerequisites: EE 16 A & B; CS 70

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Introduction to Digital Communication Systems: [Read Less](#) [-]

EL ENG 122 Introduction to Communication Networks 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

This course focuses on the fundamentals of the wired and wireless communication networks. The course covers both the architectural principles for making these networks scalable and robust, as well as the key techniques essential for analyzing and designing them. The topics include graph theory, Markov chains, queuing, optimization techniques, the physical and link layers, switching, transport, cellular networks and Wi-Fi.

Introduction to Communication Networks: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Computer Science 70. Computer Science 70

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Introduction to Communication Networks: Read Less [\[-\]](#)

EL ENG 123 Digital Signal Processing 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

Discrete time signals and systems: Fourier and Z transforms, DFT, 2-dimensional versions. Digital signal processing topics: flow graphs, realizations, FFT, chirp-Z algorithms, Hilbert transform relations, quantization effects, linear prediction. Digital filter design methods: windowing, frequency sampling, S-to-Z methods, frequency-transformation methods, optimization methods, 2-dimensional filter design.

Digital Signal Processing: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 120

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Digital Signal Processing: Read Less [\[-\]](#)

EL ENG 126 Probability and Random Processes 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2017, Fall 2016, Spring 2016

This course covers the fundamentals of probability and random processes useful in fields such as networks, communication, signal processing, and control. Sample space, events, probability law. Conditional probability. Independence. Random variables. Distribution, density functions. Random vectors. Law of large numbers. Central limit theorem. Estimation and detection. Markov chains.

Probability and Random Processes: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: EE 16A and 16B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Probability and Random Processes: Read Less [\[-\]](#)

EL ENG C128 Feedback Control Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

Analysis and synthesis of linear feedback control systems in transform and time domains. Control system design by root locus, frequency response, and state space methods. Applications to electro-mechanical and mechatronics systems.

Feedback Control Systems: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: EE 16A and either ME 132 or EE 120

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Also listed as: MEC ENG C134

Feedback Control Systems: Read Less [\[-\]](#)

EL ENG 129 Neural and Nonlinear Information Processing 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2010, Fall 2009, Spring 2009

Principles of massively parallel real-time computation, optimization, and information processing via nonlinear dynamics and analog VLSI neural networks, applications selected from image processing, pattern recognition, feature extraction, motion detection, data compression, secure communication, bionic eye, auto waves, and Turing patterns.

Neural and Nonlinear Information Processing: [Read More](#) [+]

Rules & Requirements

Prerequisites: 120 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Chua

Neural and Nonlinear Information Processing: [Read Less](#) [-]

EL ENG 130 Integrated-Circuit Devices 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

Overview of electronic properties of semiconductor. Metal-semiconductor contacts, pn junctions, bipolar transistors, and MOS field-effect transistors. Properties that are significant to device operation for integrated circuits. Silicon device fabrication technology.

Integrated-Circuit Devices: [Read More](#) [+]

Rules & Requirements

Prerequisites: EE 16A and 16B

Credit Restrictions: Students will receive no credit for EI Eng 130 after taking EI Eng 230A.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Integrated-Circuit Devices: [Read Less](#) [-]

EL ENG 134 Fundamentals of Photovoltaic Devices 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

This course is designed to give an introduction to, and overview of, the fundamentals of photovoltaic devices. Students will learn how solar cells work, understand the concepts and models of solar cell device physics, and formulate and solve relevant physical problems related to photovoltaic devices. Monocrystalline, thin film and third generation solar cells will be discussed and analyzed. Light management and economic considerations in a solar cell system will also be covered.

Fundamentals of Photovoltaic Devices: [Read More](#) [+]

Rules & Requirements

Prerequisites: EE 16A and 16B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Arias

Fundamentals of Photovoltaic Devices: [Read Less](#) [-]

EL ENG 137A Introduction to Electric Power Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Fall 2015

Overview of conventional electric power conversion and delivery, emphasizing a systemic understanding of the electric grid with primary focus at the transmission level, aimed toward recognizing needs and opportunities for technological innovation. Topics include aspects of a.c. system design, electric generators, components of transmission and distribution systems, power flow analysis, system planning and operation, performance measures, and limitations of legacy technologies.

Introduction to Electric Power Systems: [Read More](#) [+]

Rules & Requirements

Prerequisites: 16A & 16B or consent of instructor; Physics 7B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: von Meier

Introduction to Electric Power Systems: [Read Less](#) [-]

EL ENG 137B Introduction to Electric Power Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

Overview of recent and potential future evolution of electric power systems with focus on new and emerging technologies for power conversion and delivery, primarily at the distribution level. Topics include power electronics applications, solar and wind generation, distribution system design and operation, electric energy storage, information management and communications, demand response, and microgrids.

Introduction to Electric Power Systems: [Read More](#) [+]

Rules & Requirements

Prerequisites: Electrical Engineering 137A or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: von Meier

Introduction to Electric Power Systems: [Read Less](#) [-]

EL ENG 140 Linear Integrated Circuits 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

Single and multiple stage transistor amplifiers. Operational amplifiers. Feedback amplifiers, 2-port formulation, source, load, and feedback network loading. Frequency response of cascaded amplifiers, gain-bandwidth exchange, compensation, dominant pole techniques, root locus. Supply and temperature independent biasing and references. Selected applications of analog circuits such as analog-to-digital converters, switched capacitor filters, and comparators. Hardware laboratory and design project.

Linear Integrated Circuits: [Read More](#) [+]

Rules & Requirements

Prerequisites: Electrical Engineering 105

Credit Restrictions: Students will receive no credit for EI Eng 140 after taking EI Eng 240A.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Alon, Sanders

Linear Integrated Circuits: [Read Less](#) [-]

EL ENG 142 Integrated Circuits for Communications 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Spring 2016, Spring 2015

Analysis and design of electronic circuits for communication systems, with an emphasis on integrated circuits for wireless communication systems. Analysis of noise and distortion in amplifiers with application to radio receiver design. Power amplifier design with application to wireless radio transmitters. Radio-frequency mixers, oscillators, phase-locked loops, modulators, and demodulators.

Integrated Circuits for Communications: [Read More](#) [+]

Rules & Requirements

Prerequisites: EE 16A & B; EE 105

Credit Restrictions: Students will receive no credit for EI Eng 142 after taking EI Eng 242A.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Integrated Circuits for Communications: [Read Less](#) [-]

EL ENG 143 Microfabrication Technology 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Fall 2017, Spring 2017

Integrated circuit device fabrication and surface micromachining technology. Thermal oxidation, ion implantation, impurity diffusion, film deposition, epitaxy, lithography, etching, contacts and interconnections, and process integration issues. Device design and mask layout, relation between physical structure and electrical/mechanical performance. MOS transistors and poly-Si surface microstructures will be fabricated in the laboratory and evaluated.

Microfabrication Technology: [Read More](#) [+]

Rules & Requirements

Prerequisites: Physics 7B or equivalent

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Microfabrication Technology: [Read Less](#) [-]

EL ENG 144 Fundamental Algorithms for Systems Modeling, Analysis, and Optimization 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2015, Fall 2014, Fall 2013

The modeling, analysis, and optimization of complex systems requires a range of algorithms and design software. This course reviews the fundamental techniques underlying the design methodology for complex systems, using integrated circuit design as example. Topics include design flows, discrete and continuous models and algorithms, and strategies for implementing algorithms efficiently and correctly in software. Laboratory assignments and a class project will expose students to state-of-the-art tools.

Fundamental Algorithms for Systems Modeling, Analysis, and Optimization: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: EE 16A; Computer Science 70 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Keutzer, Lee, Roychowdhury, Seshia

Fundamental Algorithms for Systems Modeling, Analysis, and Optimization: Read Less [\[-\]](#)

EL ENG C145B Medical Imaging Signals and Systems 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Fall 2015

Biomedical imaging is a clinically important application of engineering, applied mathematics, physics, and medicine. In this course, we apply linear systems theory and basic physics to analyze X-ray imaging, computerized tomography, nuclear medicine, and MRI. We cover the basic physics and instrumentation that characterizes medical image as an ideal perfect-resolution image blurred by an impulse response. This material could prepare the student for a career in designing new medical imaging systems that reliably detect small tumors or infarcts.

Medical Imaging Signals and Systems: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Electrical Engineering 16A and 16B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Conolly

Also listed as: BIO ENG C165

Medical Imaging Signals and Systems: Read Less [\[-\]](#)

EL ENG C145L Introductory Electronic Transducers Laboratory 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2014, Fall 2013, Fall 2012

Laboratory exercises exploring a variety of electronic transducers for measuring physical quantities such as temperature, force, displacement, sound, light, ionic potential; the use of circuits for low-level differential amplification and analog signal processing; and the use of microcomputers for digital sampling and display. Lectures cover principles explored in the laboratory exercises; construction, response and signal to noise of electronic transducers and actuators; and design of circuits for sensing and controlling physical quantities.

Introductory Electronic Transducers Laboratory: Read More [\[+\]](#)

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Derenzo

Also listed as: BIO ENG C145L

Introductory Electronic Transducers Laboratory: Read Less [\[-\]](#)

EL ENG C145M Introductory Microcomputer Interfacing Laboratory 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2013, Spring 2012, Spring 2011

Laboratory exercises constructing basic interfacing circuits and writing 20-100 line C programs for data acquisition, storage, analysis, display, and control. Use of the IBM PC with microprogrammable digital counter/timer, parallel I/O port. Circuit components include anti-aliasing filters, the S/H amplifier, A/D and D/A converters. Exercises include effects of aliasing in periodic sampling, fast Fourier transforms of basic waveforms, the use of the Hanning filter for leakage reduction, Fourier analysis of the human voice, digital filters, and control using Fourier deconvolution. Lectures cover principles explored in the lab exercises and design of microcomputer-based systems for data acquisitions, analysis and control. Introductory Microcomputer Interfacing Laboratory: Read More [+]

Rules & Requirements

Prerequisites: EE 16A & 16B

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Derenzo

Also listed as: BIO ENG C145M

Introductory Microcomputer Interfacing Laboratory: Read Less [-]

EL ENG C145O Laboratory in the Mechanics of Organisms 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2015, Spring 2014, Spring 2013, Spring 2012

Introduction to laboratory and field study of the biomechanics of animals and plants using fundamental biomechanical techniques and equipment. Course has a series of rotations involving students in experiments demonstrating how solid and fluid mechanics can be used to discover the way in which diverse organisms move and interact with their physical environment. The laboratories emphasize sampling methodology, experimental design, and statistical interpretation of results. Latter third of course devoted to independent research projects. Written reports and class presentation of project results are required.

Laboratory in the Mechanics of Organisms: Read More [+]

Rules & Requirements

Prerequisites: Integrative Biology 135 or consent of instructor; for Electrical Engineering and Computer Science students, Electrical Engineering 105, 120 or Computer Science 184

Credit Restrictions: Students will receive no credit for C135L after taking 135L.

Hours & Format

Fall and/or spring: 15 weeks - 6 hours of laboratory, 1 hour of discussion, and 1 hour of fieldwork per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Formerly known as: Integrative Biology 135L

Also listed as: BIO ENG C136L/INTEGBI C135L

Laboratory in the Mechanics of Organisms: Read Less [-]

EL ENG 146L Application Specific Integrated Circuits Laboratory 2 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2015

This is a lab course that covers the design of modern Application-Specific Integrated Circuits (ASICs). The labs lay the foundation of modern digital design by first setting-up the scripting and hardware description language base for specification of digital systems and interactions with tool flows.

Software testing of digital designs is covered leading into a set of labs that cover the design flow. Digital synthesis, floorplanning, placement and routing are covered, as well as tools to evaluate design timing and power. Chip-level assembly is covered, instantiation of custom IP blocks: I/O pads, memories, PLLs, etc. The labs culminate with a project design – implementation of a 3-stage RISC-V processor with register file and caches.

Application Specific Integrated Circuits Laboratory: Read More [\[+\]](#)

Objectives Outcomes

Course Objectives: This course is a one-time offering to supplement the CS150 course offered in the Fall 2014, with a lab and project section that cover the Application-Specific Integrated Circuit Design. The CS150 lectures in the Fall 2014 already covered the necessary lecture material, so students who took the CS150 lab in the Fall of 2014 will have a chance to expand their skills into the area of Application-Specific Integrated Circuit design.

Hence the pre-requisite for this course is that a student has taken the CS150 course in the Fall 2014.

Rules & Requirements

Prerequisites: Electrical Engineering 40; Electrical Engineering 105 recommended and Computer Science 150 (taken Fall 2014) - mandatory

Credit Restrictions: Students will receive no credit for Electrical Engineering 146L after taking Fall 2014 version of Electrical Engineering 141/241A.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Stojanovic

Application Specific Integrated Circuits Laboratory: Read Less [\[-\]](#)

EL ENG 147 Introduction to Microelectromechanical Systems (MEMS) 3 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Fall 2015

This course will teach fundamentals of micromachining and microfabrication techniques, including planar thin-film process technologies, photolithographic techniques, deposition and etching techniques, and the other technologies that are central to MEMS fabrication. It will pay special attention to teaching of fundamentals necessary for the design and analysis of devices and systems in mechanical, electrical, fluidic, and thermal energy/signal domains, and will teach basic techniques for multi-domain analysis. Fundamentals of sensing and transduction mechanisms including capacitive and piezoresistive techniques, and design and analysis of micromachined miniature sensors and actuators using these techniques will be covered. Introduction to Microelectromechanical Systems (MEMS): Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Electrical Engineering 16A and 16B

Credit Restrictions: Students will receive no credit for El Eng 147 after taking El Eng 247A.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructors: Maharbiz, Nguyen, Pister

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

EL ENG 192 Mechatronic Design Laboratory 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Spring 2016

Design project course, focusing on application of theoretical principles in electrical engineering to control of a small-scale system, such as a mobile robot. Small teams of students will design and construct a mechatronic system incorporating sensors, actuators, and intelligence.

Mechatronic Design Laboratory: Read More [+]

Rules & Requirements

Prerequisites: EE120, EE16A+EE16B, CS61ABC

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 10 hours of laboratory per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Instructor: Fearing

Mechatronic Design Laboratory: Read Less [-]

EL ENG 194 Special Topics 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Fall 2015

Topics will vary semester to semester. See the Electrical Engineering announcements.

Special Topics: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

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 - 1-4 hours of lecture per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Special Topics: Read Less [-]

EL ENG H196A Senior Honors Thesis Research 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Fall 2015, Spring 2015

Thesis work under the supervision of a faculty member. A minimum of four units must be taken; the units may be distributed between one and two semesters in any way. To obtain credit a satisfactory thesis must be submitted at the end of the two semesters to the Electrical and Engineering and Computer Science Department archive. Students who complete four units and a thesis in one semester receive a letter grade at the end of H196A. Students who do not, receive an IP in H196A and must enroll in H196B.

Senior Honors Thesis Research: Read More [+]

Rules & Requirements

Prerequisites: Open only to students in the Electrical Engineering and Computer Science honors program

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

Grading/Final exam status: Letter grade. This is part one of a year long series course. A provisional grade of IP (in progress) will be applied and later replaced with the final grade after completing part two of the series. Final exam required.

Senior Honors Thesis Research: Read Less [-]

EL ENG H196B Senior Honors Thesis Research 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Spring 2015, Spring 2014

Thesis work under the supervision of a faculty member. A minimum of four units must be taken; the units may be distributed between one and two semesters in any way. To obtain credit a satisfactory thesis must be submitted at the end of the two semesters to the Electrical and Engineering and Computer Science Department archive. Students who complete four units and a thesis in one semester receive a letter grade at the end of H196A. Students who do not, receive an IP in H196A and must enroll in H196B.

Senior Honors Thesis Research: Read More [+]

Rules & Requirements

Prerequisites: Open only to students in the Electrical Engineering and Computer Science honors program

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

Grading/Final exam status: Letter grade. This is part two of a year long series course. Upon completion, the final grade will be applied to both parts of the series. Final exam required.

Senior Honors Thesis Research: Read Less [-]

EL ENG 197 Field Study 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2016, Fall 2015, Spring 2015

Students take part in organized individual field sponsored programs with off-campus companies or tutoring/mentoring relevant to specific aspects and applications of computer science on or off campus. Note Summer CPT or OPT students: written report required. Course does not count toward major requirements, but will be counted in the cumulative units toward graduation.

Field Study: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Consent of instructor (see department adviser)

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Summer:

6 weeks - 2.5-10 hours of fieldwork per week

8 weeks - 2-7.5 hours of fieldwork per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Field Study: Read Less [\[-\]](#)

EL ENG 198 Directed Group Study for Advanced Undergraduates 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Spring 2018, Spring 2017, Fall 2016

Group study of selected topics in electrical engineering, usually relating to new developments.

Directed Group Study for Advanced Undergraduates: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 2.0 GPA or better; 60 units completed

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Directed Group Study for Advanced Undergraduates: Read Less [\[-\]](#)

EL ENG 199 Supervised Independent Study 1 - 4 Units

Offered through: Electrical Engin and Computer Sci

Terms offered: Fall 2017, Fall 2016, Summer 2016 8 Week Session

Supervised independent study. Enrollment restrictions apply.

Supervised Independent Study: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Consent of instructor and major adviser

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

Hours & Format

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

Summer:

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Electrical Engineering/Undergraduate

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

Supervised Independent Study: Read Less [\[-\]](#)

Nuclear Engineering

NUC ENG 24 Freshman Seminars 1 Unit

Terms offered: Spring 2018, Fall 2017, Spring 2017

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

Freshman Seminars: Read More [\[+\]](#)

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Freshman Seminars: Read Less [\[-\]](#)

NUC ENG 100 Introduction to Nuclear Engineering 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

The class provides students with an overview of the contemporary nuclear energy technology with emphasis on nuclear fission as an energy source. Starting with the basic physics of the nuclear fission process, the class includes discussions on reactor control, thermal hydraulics, fuel production, and spent fuel management for various types of reactors in use around the world as well as analysis of safety and other nuclear-related issues. This class is intended for sophomore NE students, but is also open to transfer students and students from other majors.

Introduction to Nuclear Engineering: [Read More](#) [\[+\]](#)

Rules & Requirements

Prerequisites: Physics 7A and 7B, Physics 7C may be taken concurrently. Mathematics 53 and 54 may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Introduction to Nuclear Engineering: [Read Less](#) [\[-\]](#)

NUC ENG 101 Nuclear Reactions and Radiation 4 Units

Terms offered: Fall 2017, Fall 2016, Fall 2015

Energetics and kinetics of nuclear reactions and radioactive decay, fission, fusion, and reactions of low-energy neutrons; properties of the fission products and the actinides; nuclear models and transition probabilities; interaction of radiation with matter.

Nuclear Reactions and Radiation: [Read More](#) [\[+\]](#)

Rules & Requirements

Prerequisites: Physics 7C

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructors: Bernstein, L.

Nuclear Reactions and Radiation: [Read Less](#) [\[-\]](#)

NUC ENG 102 Nuclear Reactions and Radiation Laboratory 3 Units

Terms offered: Spring 2016, Spring 2015, Spring 2013

Laboratory course in nuclear physics. Experiments will allow students to directly observe phenomena discussed in Nuclear Engineering 101. These experiments will give students exposure to (1) electronics, (2) alpha, beta, gamma radiation detectors, (3) radioactive sources, and (4) experimental methods relevant for all aspects of nuclear science. Experiments include: Rutherford scattering, x-ray fluorescence, muon lifetime, gamma-gamma angular correlations, Mossbauer effect, and radon measurements.

Nuclear Reactions and Radiation Laboratory: [Read More](#) [\[+\]](#)

Rules & Requirements

Prerequisites: 101

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Norman

Nuclear Reactions and Radiation Laboratory: [Read Less](#) [\[-\]](#)

NUC ENG 104 Radiation Detection and Nuclear Instrumentation Laboratory 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Basic science of radiation measurement, nuclear instrumentation, neutronics, radiation dosimetry. The lectures emphasize the principles of radiation detection. The weekly laboratory applies a variety of radiation detection systems to the practical measurements of interest for nuclear power, nuclear and non-nuclear science, and environmental applications. Students present goals and approaches of the experiments being performed.

Radiation Detection and Nuclear Instrumentation Laboratory: [Read More](#) [\[+\]](#)

Rules & Requirements

Prerequisites: 101 or equivalent or consent of instructor; 150 or equivalent recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Vetter

Formerly known as: 104A

Radiation Detection and Nuclear Instrumentation Laboratory: [Read Less](#) [\[-\]](#)

NUC ENG 107 Introduction to Imaging 3 Units

Terms offered: Fall 2016, Fall 2014, Fall 2012

Introduction to medical imaging physics and systems, including x-ray computed tomography (CT), nuclear magnetic resonance (NMR), positron emission tomography (PET), and SPECT; basic principles of tomography and an introduction to unfolding methods; resolution effects of counting statistics, inherent system resolution and human factors.

Introduction to Imaging: [Read More](#) [+]

Rules & Requirements

Prerequisites: 101 and 104A or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Vetter

Introduction to Imaging: [Read Less](#) [-]

NUC ENG 120 Nuclear Materials 4 Units

Terms offered: Fall 2017, Fall 2016, Fall 2015

Effects of irradiation on the atomic and mechanical properties of materials in nuclear reactors. Fission product swelling and release; neutron damage to structural alloys; fabrication and properties of uranium dioxide fuel.

Nuclear Materials: [Read More](#) [+]

Rules & Requirements

Prerequisites: Engineering 45 and an upper division course in thermodynamics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Wirth

Nuclear Materials: [Read Less](#) [-]

NUC ENG 124 Radioactive Waste Management 3 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015

Components and material flowsheets for nuclear fuel cycle, waste characteristics, sources of radioactive wastes, compositions, radioactivity and heat generation; waste treatment technologies; waste disposal technologies; safety assessment of waste disposal.

Radioactive Waste Management: [Read More](#) [+]

Rules & Requirements

Prerequisites: Engineering 117 or equivalent course

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Ahn

Radioactive Waste Management: [Read Less](#) [-]

NUC ENG 130 Analytical Methods for Non-proliferation 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Use of nuclear measurement techniques to detect clandestine movement and/or possession of nuclear materials by third parties. Nuclear detection, forensics, signatures, and active and passive interrogation methodologies will be explored. Techniques currently deployed for arms control and treaty verification will be discussed. Emphasis will be placed on common elements of detection technology from the viewpoint of resolution of threat signatures from false positives due to naturally occurring radioactive material. Topics include passive and active neutron signals, gamma ray detection, fission neutron multiplicity, and U and Pu isotopic identification and age determination.

Analytical Methods for Non-proliferation: [Read More](#) [+]

Rules & Requirements

Prerequisites: 101 or equivalent course in nuclear physics, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Morse

Analytical Methods for Non-proliferation: [Read Less](#) [-]

NUC ENG 150 Introduction to Nuclear Reactor Theory 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Neutron interactions, nuclear fission, and chain reacting systematics in thermal and fast nuclear reactors. Diffusion and slowing down of neutrons. Criticality calculations. Nuclear reactor dynamics and reactivity feedback. Production of radionuclides in nuclear reactors.

Introduction to Nuclear Reactor Theory: [Read More](#) [+]

Rules & Requirements

Prerequisites: 101; Mathematics 53 and 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: Nuclear Engineering/Undergraduate

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

Instructors: Greenspan, Vujic

Introduction to Nuclear Reactor Theory: [Read Less](#) [-]

NUC ENG 155 Introduction to Numerical Simulations in Radiation Transport 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Computational methods used to analyze radiation transport described by various differential, integral, and integro-differential equations. Numerical methods include finite difference, finite elements, discrete ordinates, and Monte Carlo. Examples from neutron and photon transport; numerical solutions of neutron/photon diffusion and transport equations. Monte Carlo simulations of photon and neutron transport. An overview of optimization techniques for solving the resulting discrete equations on vector and parallel computer systems.

Introduction to Numerical Simulations in Radiation Transport: [Read More](#) [+]

Rules & Requirements

Prerequisites: Mathematics 53 and 54

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructors: Vujic, Wirth

Introduction to Numerical Simulations in Radiation Transport: [Read Less](#) [-]

NUC ENG 161 Nuclear Power Engineering 4 Units

Terms offered: Fall 2017, Fall 2016, Fall 2015

Energy conversion in nuclear power systems; design of fission reactors; thermal and structural analysis of reactor core and plant components; thermal-hydraulic analysis of accidents in nuclear power plants; safety evaluation and engineered safety systems.

Nuclear Power Engineering: [Read More](#) [+]

Rules & Requirements

Prerequisites: Course(s) in fluid mechanics and heat transfer; junior-level course in thermodynamics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Peterson

Nuclear Power Engineering: [Read Less](#) [-]

NUC ENG 162 Radiation Biophysics and Dosimetry 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Interaction of radiation with matter; physical, chemical, and biological effects of radiation on human tissues; dosimetry units and measurements; internal and external radiation fields and dosimetry; radiation exposure regulations; sources of radiation and radioactivity; basic shielding concepts; elements of radiation protection and control; theories and models for cell survival, radiation sensitivity, carcinogenesis, and dose calculation.

Radiation Biophysics and Dosimetry: [Read More](#) [+]

Rules & Requirements

Prerequisites: Upper division standing or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Vujic

Radiation Biophysics and Dosimetry: [Read Less](#) [-]

NUC ENG 167 Risk-Informed Design for Advanced Nuclear Systems 3 Units

Terms offered: Fall 2017, Fall 2015, Fall 2014

Project-based class for design and licensing of nuclear facilities, including advanced reactors. Elements of a project proposal. Regulatory framework and use of deterministic and probabilistic licensing criteria. Siting criteria. External and internal events. Identification and analysis of design basis and beyond design basis events. Communication with regulators and stakeholders. Ability to work in and contribute to a design team.

Risk-Informed Design for Advanced Nuclear Systems: [Read More](#) [+]

Objectives Outcomes

Course Objectives: * Introduce students to the methods and models for event identification, accident analysis, and risk assessment and management for internally and externally initiated events.

* Introduce students to the regulatory requirements for design, construction and operation of nuclear facilities licensed by the U.S. Nuclear Regulatory Commission.

* Introduce students to the safety principles and methods used to design, construct and operate a safe nuclear facility, for a specific site and application.

* Provide a basic understanding of similarities and differences in regulation of nuclear facilities versus other technologies (biotech, commercial aviation, commercial space launch, civil infrastructure).

* Provide a basic understanding the risk-informed design process and an opportunity to experience contributing in a focused area to a design project.

* Provide students with experiential knowledge in developing schedules, allocating work responsibilities, and working in teams.

* Provide students with experiential knowledge in the preparation and evaluation a Safety Analysis Report for meeting USNRC regulatory requirements, including response to Requests for Additional Information (RAIs).

Student Learning Outcomes: * Develop a broad understanding of safety principles and methods used in design, construction and licensing of nuclear facilities.

* Develop a broad understanding of the U.S. Nuclear Regulatory Commission's regulatory requirements for nuclear facilities.

* Have awareness of key similarities and differences in regulation of nuclear facilities versus other technologies (biotech, commercial aviation, commercial space launch, civil infrastructure).

* Have awareness of the major topics covered in a Safety Analysis Report (SAR) and experience in developing and writing at least one element of a SAR.

* Have developed experience and skills in communication with the business community, the public, and regulators.

* Have developed experience and skills in establishing a project schedule, allocating work responsibilities, and working in teams.

* Have understanding of application of event identification, event frequency and consequence analysis, risk assessment and management for internally and externally initiated events in the design process.

Rules & Requirements

Prerequisites: Completion of at least two upper-division engineering courses providing relevant skills: ChemE 150A, ChemE 180, CE 111, CE 120, CE152, CE 166, CE 175, E 120, IEOR 166, IEOR 172, ME 106, ME 109, ME 128, ME 146, NE 120, NE 124, NE 150, NE 161

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

NUC ENG 170A Nuclear Design: Design in Nuclear Power Technology and Instrumentation 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Design of various fission and fusion power systems and other physically based applications. Each semester a topic will be chosen by the class as a whole. In addition to technology, the design should address issues relating to economics, the environment, and risk assessment.

Nuclear Design: Design in Nuclear Power Technology and Instrumentation: [Read More](#) [+]

Rules & Requirements

Prerequisites: Senior standing or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Formerly known as: 170

Nuclear Design: Design in Nuclear Power Technology and Instrumentation: [Read Less](#) [-]

NUC ENG 170B Nuclear Design: Design in Bionuclear, Nuclear Medicine, and Radiation Therapy 3 Units

Terms offered: Spring 2010, Spring 2009, Spring 2008

A systems approach to the development of procedures for nuclear medicine and radiation therapy. Each semester a specific procedure will be studied and will entail the development of the biological and physiological basis for a procedure, the chemical and biochemical characteristics of appropriate drugs, dosimetric requirements and limitations, the production and distribution of radionuclides and/or radiation fields to be applied, and the characteristics of the instrumentation to be used.

Nuclear Design: Design in Bionuclear, Nuclear Medicine, and Radiation Therapy: [Read More](#) [+]

Rules & Requirements

Prerequisites: 107, 161, or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Formerly known as: 167

Nuclear Design: Design in Bionuclear, Nuclear Medicine, and Radiation Therapy: [Read Less](#) [-]

NUC ENG 175 Methods of Risk Analysis 3 Units

Terms offered: Fall 2013, Fall 2011, Fall 2009

Methodological approaches for the quantification of technological risk and risk based decision making. Probabilistic safety assessment, human health risks, environmental and ecological risk analysis.

Methods of Risk Analysis: Read More [+]

Rules & Requirements

Prerequisites: Upper division standing

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Kastenberg

Methods of Risk Analysis: Read Less [-]

NUC ENG 180 Introduction to Controlled Fusion 3 Units

Terms offered: Fall 2017, Fall 2016, Fall 2015

Introduction to energy production by controlled thermonuclear reactions. Nuclear fusion reactions, energy balances for fusion systems, survey of plasma physics; neutral beam injection; RF heating methods; vacuum systems; tritium handling.

Introduction to Controlled Fusion: Read More [+]

Rules & Requirements

Prerequisites: Physics 7C

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Instructor: Morse

Introduction to Controlled Fusion: Read Less [-]

NUC ENG H194 Honors Undergraduate Research 1 - 4 Units

Terms offered: Spring 2018, Fall 2017, Spring 2017

Supervised research. Students who have completed three or more upper division courses may pursue original research under the direction of one of the members of the staff. A final report or presentation is required. A maximum of three units of H194 may be used to fulfill a technical elective requirement in the Nuclear Engineering general program or joint major programs.

Honors Undergraduate Research: Read More [+]

Rules & Requirements

Prerequisites: Upper division technical GPA of 3.3, consent of instructor and faculty advisor

Repeat rules: Course may be repeated for credit once. Course may be repeated once for credit. Course may be repeated for a maximum of 8 units.

Hours & Format

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

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Honors Undergraduate Research: Read Less [-]

NUC ENG 198 Group Study for Advanced Undergraduates 1 - 4 Units

Terms offered: Spring 2018, Fall 2017, Spring 2017

Group studies of selected topics.

Group Study for Advanced Undergraduates: Read More [+]

Rules & Requirements

Prerequisites: Upper division standing

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Group Study for Advanced Undergraduates: Read Less [-]

NUC ENG 199 Supervised Independent Study 1 - 4 Units

Terms offered: Spring 2018, Fall 2017, Spring 2017

Supervised independent study. Enrollment restrictions apply; see the Introduction to Courses and Curricula section of this catalog.

Supervised Independent Study: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Course may be repeated for credit for a maximum of 4 units per semester.

Hours & Format

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

Summer:

6 weeks - 1-5 hours of independent study per week

8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Supervised Independent Study: Read Less [\[-\]](#)

NUC ENG S199 Supervised Independent Study 1 - 4 Units

Terms offered: Prior to 2007

Supervised independent study. Please see section of the for description and prerequisites.

Supervised Independent Study: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Consent of instructor and major adviser

Credit Restrictions: Course may be repeated for credit for a maximum of 4 units per semester.

Hours & Format

Summer: 8 weeks - 0 hours of independent study per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Supervised Independent Study: Read Less [\[-\]](#)

NUC ENG 200M Introduction to Nuclear Engineering 3 Units

Terms offered: Spring 2018, Spring 2017

Overview of the elements of nuclear technology in use today for the production of energy and other radiation applications. Emphasis is on nuclear fission as an energy source, with a study of the basic physics of the nuclear fission process followed by detailed discussions of issues related to the control, radioactivity management, thermal energy management, fuel production, and spent fuel management. A discussion of the various reactor types in use around the world will include analysis of safety and nuclear proliferation issues surrounding the various technologies. Case studies of some reactor accidents and other nuclear-related incidents will be included.

Introduction to Nuclear Engineering: Read More [\[+\]](#)

Objectives Outcomes

Course Objectives: (1) To give students an understanding of the basic concepts of nuclear energy and other radiation applications, together with an overview of related aspects such as proliferation and waste management.

(2) To provide students an overview of the elements of nuclear technology in use today for the production of energy and to set those elements in the broader context of nuclear technology.

Student Learning Outcomes: At the end of the course, students should be able to:

- understand basic theoretical concepts of nuclear physics, reactor physics, and energy removal
- describe radiation damage mechanisms in materials and biological tissue, estimate radiation dose, understand radiation shielding
- understand the concepts of chain reaction, neutron balance, criticality, reactivity, and reactivity control
- describe the main nuclear power reactor designs and identify their major components
- describe core components and understand their function
- calculate cost of electricity based on simple economic principles
- describe the difference between PWR and BWR in terms of core design, steam cycle, and operation
- understand the concept of design-basis accidents, their causes, and their consequences
- identify the main steps and related facilities of fuel cycle
- understand the fundamental aspects of used fuel reprocessing and disposal

Rules & Requirements

Prerequisites: Students taking the class should have completed the equivalents of the Physics 7
sequence and the Mathematics 50 sequence or consent of instructor

Credit Restrictions: This course is restricted to students enrolled in the Master of Engineering degree program who may not use more than two "200M-level" courses towards their degree. Students will receive no credit for NE 200M after taking NE 100.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Fratoni

Introduction to Nuclear Engineering: Read Less [\[-\]](#)

NUC ENG 201 Nuclear Reactions and Interactions of Radiation with Matter 4 Units

Terms offered: Spring 2018, Spring 2016, Spring 2014

Interaction of gamma rays, neutrons, and charged particles with matter; nuclear structure and radioactive decay; cross sections and energetics of nuclear reactions; nuclear fission and the fission products; fission and fusion reactions as energy sources.

Nuclear Reactions and Interactions of Radiation with Matter: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 101

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Norman

Nuclear Reactions and Interactions of Radiation with Matter: Read Less [\[-\]](#)

NUC ENG 204 Advanced Concepts in Radiation Detection and Measurements 3 Units

Terms offered: Spring 2018, Fall 2015, Fall 2013

Advanced concepts in the detection of ionizing radiation relevant for basic and applied sciences, nuclear non-proliferation, and homeland security. Concepts of signal generation and processing with advantages and drawbacks of a range of detection technologies. Laboratory comprises experiments to compare conventional analog and advanced digital signal processing, information generation and processing, position-sensitive detection, tracking, and imaging modalities.

Advanced Concepts in Radiation Detection and Measurements: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Graduate standing, 104 or similar course or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Vetter

Advanced Concepts in Radiation Detection and Measurements: Read Less [\[-\]](#)

NUC ENG 220 Irradiation Effects in Nuclear Materials 3 Units

Terms offered: Spring 2017, Spring 2015, Spring 2013

Physical aspects and computer simulation of radiation damage in metals. Void swelling and irradiation creep. Mechanical analysis of structures under irradiation. Sputtering, blistering, and hydrogen behavior in fusion reactor materials.

Irradiation Effects in Nuclear Materials: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 120 or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Wirth

Irradiation Effects in Nuclear Materials: Read Less [\[-\]](#)

NUC ENG 221 Corrosion in Nuclear Power Systems 3 Units

Terms offered: Spring 2018, Spring 2016, Spring 2014

Structural metals in nuclear power plants; properties and fabrication of Zircaloy; aqueous corrosion of reactor components; structural integrity of reactor components under combined mechanical loading, neutron irradiation, and chemical environment.

Corrosion in Nuclear Power Systems: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 120, Materials Science and Mineral Engineering 112 recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Wirth

Corrosion in Nuclear Power Systems: Read Less [\[-\]](#)

NUC ENG 224 Safety Assessment for Geological Disposal of Radioactive Wastes 3 Units

Terms offered: Spring 2014, Spring 2013, Spring 2012

Multi-barrier concept; groundwater hydrology, mathematical modeling of mass transport in heterogeneous media, source term for far-field model; near-field chemical environment, radionuclide release from waste solids, modeling of radionuclide transport in the near field, effect of temperature on repository performance, effect of water flow, effect of geochemical conditions, effect of engineered barrier alteration; overall performance assessment, performance index, uncertainty associated with assessment, regulation and standards.

Safety Assessment for Geological Disposal of Radioactive Wastes: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: 124 or upper division course in differential equations

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Ahn

Safety Assessment for Geological Disposal of Radioactive Wastes: Read Less [\[-\]](#)

NUC ENG 225 The Nuclear Fuel Cycle 3 Units

Terms offered: Spring 2015, Spring 2013, Spring 2011

This course is intended for graduate students interested in acquiring a foundation in nuclear fuel cycle with topics ranging from nuclear-fuel reprocessing to waste treatment and final disposal. The emphasis is on the relationship between nuclear-power utilization and its environmental impacts. The goal is for graduate engineering students to gain sufficient understanding in how nuclear-power utilization affects the environment, so that they are better prepared to design an advanced system that would result in minimized environmental impact. The lectures will consist of two parts. The first half includes mathematical models for individual processes in a fuel cycle, such as nuclear fuel reprocessing, waste solidification, repository performance, and nuclear transmutation in a nuclear reactor. In the second half, these individual models are integrated, which enables students to evaluate environmental impact of a fuel cycle.

The Nuclear Fuel Cycle: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor; 124 and 150 are recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Ahn

The Nuclear Fuel Cycle: Read Less [\[-\]](#)

NUC ENG 230 Analytical Methods for Non-Proliferation 3 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Use of nuclear measurement techniques to detect clandestine movement and/or possession of nuclear materials by third parties.

Nuclear detection, forensics, signatures, and active and passive interrogation methodologies will be explored. Techniques currently deployed for arms control and treaty verification will be discussed.

Emphasis will be placed on common elements of detection technology from the viewpoint of resolution of threat signatures from false positives due to naturally occurring

radioactive material. Topics include passive and active neutron signals, gamma ray detection, fission neutron multiplicity, and U and Pu isotopic identification and age determination.

Analytical Methods for Non-Proliferation: [Read More](#) [+]

Rules & Requirements

Prerequisites: 101, Physics 7C, or equivalent course in nuclear physics

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

Analytical Methods for Non-Proliferation: [Read Less](#) [-]

NUC ENG 250 Nuclear Reactor Theory 4 Units

Terms offered: Fall 2017, Fall 2015, Fall 2013

Fission characteristics; neutron chain reactions, neutron transport and diffusion theory; reactor kinetics; multigroup methods, fast and thermal spectrum calculations, inhomogeneous reactor design, effects of poisons and fuel depletion.

Nuclear Reactor Theory: [Read More](#) [+]

Rules & Requirements

Prerequisites: 101, 150; Engineering 117 recommended

Hours & Format

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

Summer: 6 weeks - 10 hours of lecture per week

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Greenspan

Nuclear Reactor Theory: [Read Less](#) [-]

NUC ENG 255 Numerical Simulation in Radiation Transport 3 Units

Terms offered: Fall 2016, Fall 2014, Fall 2012

Computational methods used to analyze nuclear reactor systems described by various differential, integral, and integro-differential equations. Numerical methods include finite difference, finite elements, discrete ordinates, and Monte Carlo. Examples from neutron and photon transport, heat transfer, and thermal hydraulics. An overview of optimization techniques for solving the resulting discrete equations on vector and parallel computer systems.

Numerical Simulation in Radiation Transport: [Read More](#) [+]

Rules & Requirements

Prerequisites: 150

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Vujic

Numerical Simulation in Radiation Transport: [Read Less](#) [-]

NUC ENG 260 Thermal Aspects of Nuclear Reactors 4 Units

Terms offered: Fall 2016, Fall 2014, Fall 2012

Fluid dynamics and heat transfer; thermal and hydraulic analysis of nuclear reactors; two-phase flow and boiling; compressible flow; stress analysis; energy conversion methods.

Thermal Aspects of Nuclear Reactors: [Read More](#) [+]

Rules & Requirements

Prerequisites: Mechanical Engineering 106 and 109 or Chemical Engineering 150B

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Peterson

Thermal Aspects of Nuclear Reactors: [Read Less](#) [-]

NUC ENG 262 Radiobiology 3 Units

Terms offered: Not yet offered

Radiobiology is concerned with the action of ionizing radiation on biological tissues and living organisms. It combines two disciplines: radiation physics and biology. Radiobiology combines our understanding of ionizing radiation and molecular biology, and is a required knowledge for health physicists, radiation biologists and medical physicists. This course will provide such knowledge for a diverse group of students with need in either disciplines. This course represents one of the requisites for the Joint UC Berkeley-UC San Francisco Medical Physics Certificate Program.

Radiobiology: Read More [+]

Objectives Outcomes

Course Objectives: A group project will be expected from students and computer models will be turned in at the end of the semester, either focusing on cancer risk tools, epidemiologic analysis, radiation cancer models or cancer treatment by radiation. The project should give students strong foundation to tackle more advanced risk models or dynamic cancer models.

They will be exposed to the multi-scale complexity of the tissue response to ionizing radiation from the whole organism to individual cells and down to the DNA. Molecular biology describing the cellular response and the DNA repair mechanisms will be covered, with an emphasis on cell kinetics such as recovery processes and cell cycle sensitivity. The overall tissue response will also be discussed with an effort to distinguish acute and delayed effects. Radiation risk models and their impact on limits will be introduced and described in the context of past and current research. This course is designed for Nuclear Engineering students and in particular those pursuing a Medical Physics Certificate with knowledge essential to radiobiology. Students will learn about the history of radiation effects, epidemiology of radiation and evidence of cancer in populations.

Student Learning Outcomes: By the end of the class, students should:

- Be proficient in the main mechanisms describing the interaction of ionizing radiation with tissue;
- Be able to know the existing gaps in this field and where more research is needed;
- Understand how radiation affects DNA and leads to gene mutation
- Understand how cancer rises from various radiation damage in the tissue (targeted and non-targeted effects)
- Able to write computer model for radiation risk assessment
- Able to write computer model for cancer formation
- Understand the main methods to treat cancer with radiation
- Can differentiate tissue effect between low and high LET
- Understand the various risk issues dealing with radiation: occupational (medical, nuclear worker, astronauts ...), vs population (accident, terrorism ...)
- Be able to read scientific articles in the radiation biology field

Rules & Requirements

Prerequisites: Students are expected to have completed a course in basic radiology, radiation protection, and dosimetry (NE162 or equivalent). In addition, a class in radiation detection and instrumentation (e.g. NE104 or equivalent) and in introductory programming (Engineering 7 or equivalent) are recommended, but not required. Prerequisites may be waived by consent of the instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

NUC ENG 265 Design Analysis of Nuclear Reactors 3 Units

Terms offered: Fall 2016, Fall 2015, Fall 2013

Principles and techniques of economic analysis to determine capital and operating costs; fuel management and fuel cycle optimization; thermal limits on reactor performance, thermal converters, and fast breeders; control and transient problems; reactor safety and licensing; release of radioactivity from reactors and fuel processing plants.

Design Analysis of Nuclear Reactors: Read More [+]

Rules & Requirements

Prerequisites: 150 and 161

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Greenspan

Design Analysis of Nuclear Reactors: Read Less [-]

NUC ENG 267 Risk-Informed Design for Advanced Nuclear Systems 3 Units

Terms offered: Fall 2017, Fall 2015, Fall 2012

Project-based class for design and licensing of nuclear facilities, including advanced reactors. Elements of a project proposal. Regulatory framework and use of deterministic and probabilistic licensing criteria. Siting criteria. External and internal events. Identification and analysis of design basis and beyond design basis events. Communication with regulators and stakeholders. Ability to work in and contribute to a design team.

Risk-Informed Design for Advanced Nuclear Systems: Read More [+]

Rules & Requirements

Prerequisites: Completion of at least two upperdivision engineering courses providing relevant skills: ChemE 150A, ChemE 180, CE 111, CE 120, CE152, CE 166, CE 175, E 120, IEOR 166, IEOR 172, ME 106, ME 109, ME 128, ME 146, Nuc Eng 120, Nuc Eng 124, Nuc Eng 150, Nuc Eng 161

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Peterson

Risk-Informed Design for Advanced Nuclear Systems: Read Less [-]

NUC ENG 275 Principles and Methods of Risk Analysis 4 Units

Terms offered: Fall 2013, Fall 2011, Fall 2009

Principles and methodological approaches for the quantification of technological risk and risk-based decision making.

Principles and Methods of Risk Analysis: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor. Civil Engineering 193 and Industrial Engineering 166 recommended

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Kastenberg

Principles and Methods of Risk Analysis: Read Less [-]

NUC ENG 280 Fusion Reactor Engineering 3 Units

Terms offered: Spring 2017, Spring 2015, Spring 2013

Engineering and design of fusion systems. Introduction to controlled thermonuclear fusion as an energy economy, from the standpoint of the physics and technology involved. Case studies of fusion reactor design. Engineering principles of support technology for fusion systems.

Fusion Reactor Engineering: Read More [+]

Rules & Requirements

Prerequisites: 120 and 180

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

Fusion Reactor Engineering: Read Less [-]

NUC ENG 281 Fully Ionized Plasmas 3 Units

Terms offered: Spring 2018, Spring 2016, Spring 2014

Introduction to warm and hot magnetized plasmas. Single particle motion in electric and magnetic fields. Collective particle oscillations, waves and instabilities. Magnetohydrodynamic equilibria, stability and transport.

Magnetically confined plasmas for controlled fusion. Space plasmas.

Fully Ionized Plasmas: Read More [+]

Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: Morse

Formerly known as: Electrical Engineering 239B

Fully Ionized Plasmas: Read Less [-]

NUC ENG C282 Charged Particle Sources and Beam Technology 3 Units

Terms offered: Spring 2018, Fall 2015, Fall 2013, Fall 2011

Topics in this course will include the latest technology of various types of ion and electron sources, extraction and formation of charge particle beams, computer simulation of beam propagation, diagnostics of ion sources and beams, and the applications of beams in fusion, synchrotron light source, neutron generation, microelectronics, lithography, and medical therapy. This is a general accelerator technology and engineering course that will be of interest to graduate students in physics, electrical engineering, and nuclear engineering.

Charged Particle Sources and Beam Technology: Read More [+]

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructors: Leung, Steier

Also listed as: ENGIN C282

Charged Particle Sources and Beam Technology: Read Less [-]

NUC ENG C285 Nuclear Security: The Nexus Between Policy and Technology 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

The course will review the origins and evolution of nuclear energy, how it has been applied for both peaceful and military purposes, and the current and prospective challenges it presents. The purpose of the course is to educate students on the policy roots and technological foundations of nuclear energy and nuclear weapons so they are positioned to make original contributions to the field in their scholarly and professional careers.

Nuclear Security: The Nexus Between Policy and Technology: Read More [+]

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructors: Nacht, Prussin

Also listed as: PUB POL C285

Nuclear Security: The Nexus Between Policy and Technology: Read Less [-]

NUC ENG 290A Special Topics in Applied Nuclear Physics 3 Units

Terms offered: Fall 2017, Spring 2016, Fall 2014

Special topics in applied nuclear physics. Topics may include applied nuclear reactions and instrumentation, bionuclear and radiological physics, and subsurface nuclear technology, among other possibilities. Course content may vary from semester to semester depending upon the instructor.

Special Topics in Applied Nuclear Physics: Read More [+]

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Instructor: van Bibber

Special Topics in Applied Nuclear Physics: Read Less [-]

NUC ENG 290B Special Topics in Nuclear Materials and Chemistry 3 Units

Terms offered: Spring 2016, Spring 2015, Spring 2013

Special topics in nuclear materials and chemistry. Topics may include advanced nuclear materials and corrosion. Course content may vary from semester to semester depending upon the instructor.

Special Topics in Nuclear Materials and Chemistry: Read More [+]

Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Nuclear Materials and Chemistry: Read Less [-]

NUC ENG 290C Special Topics in Nuclear Energy 3 Units

Terms offered: Summer 2002 10 Week Session

Special topics in nuclear energy. Topics may include fission reactor analysis and engineering, nuclear thermal hydraulics, and risk, safety and large-scale systems analysis. Course content may vary from semester to semester depending on the instructor.

Special Topics in Nuclear Energy: Read More [+]

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Nuclear Energy: Read Less [-]

NUC ENG 290D Special Topics in Nuclear Non-Proliferation 3 Units

Terms offered: Fall 2014, Summer 2005 10 Week Session, Summer 2004 10 Week Session

Special topics in nuclear non-proliferation. Topics may include homeland security and nuclear policy, and nuclear fuel cycle and waste management. Course content may vary from semester to semester depending on the instructor.

Special Topics in Nuclear Non-Proliferation: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Nuclear Non-Proliferation: Read Less [\[-\]](#)

NUC ENG 290E Special Topics in Environmental Aspects of Nuclear Energy 3 Units

Terms offered: Spring 2018, Fall 2015, Fall 2014

Special topics in environmental aspects of nuclear energy. Lectures on special topics of interest in environmental impacts of nuclear power utilizations, including severe accidents. The course content may vary from semester to semester, and will be announced at the beginning of each semester.

Special Topics in Environmental Aspects of Nuclear Energy: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Environmental Aspects of Nuclear Energy: Read Less [\[-\]](#)

NUC ENG 290F Special Topics in Fusion and Plasma Physics 3 Units

Terms offered: Summer 2007 10 Week Session, Summer 2007 3 Week Session

Special topics in fusion and plasma physics. Topics may include laser, particle beam and plasma technologies, fusion science and technology, and accelerators. Course content may vary from semester to semester depending upon the instructor.

Special Topics in Fusion and Plasma Physics: Read More [\[+\]](#)

Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

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

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Letter grade.

Special Topics in Fusion and Plasma Physics: Read Less [\[-\]](#)

NUC ENG 295 Nuclear Engineering Colloquium 0.0 Units

Terms offered: Spring 2018, Fall 2017, Spring 2017

Presentations on current topics of interest in nuclear technology by experts from government, industry and universities. Open to the campus community.

Nuclear Engineering Colloquium: Read More [\[+\]](#)

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructor: van Bibber

Nuclear Engineering Colloquium: Read Less [\[-\]](#)

NUC ENG 298 Group Research Seminars 1 Unit

Terms offered: Spring 2018, Fall 2017, Spring 2017

Seminars in current research topics in nuclear engineering: Section 1 - Fusion; Section 2 - Nuclear Waste Management; Section 3 - Nuclear Thermal Hydraulics; Section 4 - Nuclear Chemistry; Section 6 - Nuclear Materials; Section 7 - Fusion reaction design; Section 8 - Nuclear Instrumentation.

Group Research Seminars: Read More [a+]

Rules & Requirements

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Group Research Seminars: Read Less [-]

NUC ENG 299 Individual Research 1 - 12 Units

Terms offered: Spring 2018, Fall 2017, Spring 2017

Investigation of advanced nuclear engineering problems.

Individual Research: Read More [a+]

Rules & Requirements

Prerequisites: Graduate standing

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Research: Read Less [-]

NUC ENG N299 Individual Research 1 - 6 Units

Terms offered: Summer 2009 10 Week Session, Summer 2006 10 Week Session, Summer 2005 10 Week Session

Investigation of advanced nuclear engineering problems.

Individual Research: Read More [a+]

Rules & Requirements

Prerequisites: Graduate standing

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Research: Read Less [-]

NUC ENG 375 Teaching Techniques in Nuclear Engineering 1 - 3 Units

Terms offered: Fall 2017, Fall 2016, Fall 2015

This course is designed to acquaint new teaching assistants with the nature of graduate student instruction in courses in the department of Nuclear Engineering. Discussion, practice, and review of issues relevant to the teaching of nuclear engineering. Effective teaching methods will be introduced by experienced GSIs and faculty.

Teaching Techniques in Nuclear Engineering: Read More [a+]

Rules & Requirements

Prerequisites: Graduate standing or ASE status

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Formerly known as: Nuclear Engineering 301

Teaching Techniques in Nuclear Engineering: Read Less [-]

NUC ENG 602 Individual Study for Doctoral Students 1 - 8 Units

Terms offered: Fall 2017, Spring 2017, Fall 2016

Individual study in consultation with the major field adviser, intended to provide an opportunity for qualified students to prepare themselves for the various examinations required of candidates for the Ph.D.

Individual Study for Doctoral Students: [Read More](#) [+]

Rules & Requirements

Prerequisites: For candidates for doctoral degree

Credit Restrictions: Course does not satisfy unit or residence requirements for doctoral degree.

Repeat rules: Course may be repeated for credit.

Hours & Format

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

Additional Details

Subject/Course Level: Nuclear Engineering/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

Individual Study for Doctoral Students: [Read Less](#) [-]