Chemical Engineering/ 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. The joint majors contain comparable proportions of coursework in both major fields. While they require slightly increased course loads, they can be completed in four years. Both majors are shown on the student's transcript of record. Students in this joint major program are concurrently enrolled in both the College of Engineering and the College of Chemistry, but their college of residence will be the College of Chemistry.

The areas of nuclear technology that depend heavily upon chemical engineering training include isotope separation, fuel reprocessing, waste management, feed material preparation, fuel chemistry, effluent control, fusion reactor fuel processing, and new reactor types.

Admission to the Joint Major

Admission to the joint major programs is open to transfer students but closed to freshmen. Continuing students may petition for a change to a joint major program after their first year. For further details regarding how to declare the joint major, please contact the College of Chemistry.

Other Joint Major Offered with the College of Engineering

Chemical Engineering/Materials Science Engineering (http://guide.berkeley.edu/archive/2018-19/undergraduate/degree-programs/chemical-engineering-materials-science-joint-major)

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

General Guidelines

1. A minimum grade point average (GPA) of 2.0 must be maintained in all courses undertaken at UC Berkeley, including those from UC Summer Sessions, UC Education Abroad Program, UC Berkeley in Washington Program, and XB courses from University Extension.
2. A minimum GPA of 2.0 in all courses taken in the college is required in order to advance and continue in the upper division.
3. A minimum GPA of 2.0 in all upper division courses taken at the University is required to satisfy major requirements.
4. Students in the College of Chemistry who receive a grade of D+ or lower in a chemical and biomolecular engineering or chemistry course for which a grade of C- or higher is required must repeat the course at UC Berkeley.

For information regarding grade requirements in specific courses, please see the notes sections below.

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

Please note, the Academic Guide is updated only once a year. For the most current information on requirements please a look at the College of Chemistry website (https://chemistry.berkeley.edu/ugrad/degrees/cheme/joint-majors).

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	4
or CHEM 4A	General Chemistry and Quantitative Analysis	
CHEM 1B	General Chemistry	4
or CHEM 4B	General Chemistry and Quantitative Analysis	
CHM ENG 40	Introduction to Chemical Engineering Design	2
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
PHYSICS 7C	Physics for Scientists and Engineers	4
ENGIN 7	Introduction to Computer Programming for Scientists and Engineers	4
MAT SCI 45	Properties of Materials	3
MAT SCI 45L	Properties of Materials Laboratory	1

Upper Division Requirements

CHEM 120A	Physical Chemistry	3-4
or PHYSICS 137A	Quantum Mechanics	
CHM ENG 140	Introduction to Chemical Process Analysis	4
CHM ENG 141	Chemical Engineering Thermodynamics	4
CHM ENG 142	Chemical Kinetics and Reaction Engineering	4
CHM ENG 150A	Transport Processes	4
CHM ENG 150B	Transport and Separation Processes	4
CHM ENG 154	Chemical Engineering Laboratory	4
CHM ENG 160	Chemical Process Design	4
or NUC ENG 170A	Nuclear Design: Design in Nuclear Power Technology and Instrumentation	
CHM ENG 162	Dynamics and Control of Chemical Processes	4
ENGIN 117	Methods of Engineering Analysis	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 162	Radiation Biophysics and Dosimetry	3
or BIOLOGY 1A	General Biology Lecture	
Nuclear engineering electives: select 6 units of upper division NUC ENG courses		
Engineering electives: select 3-4 units of upper division engineering courses.		

All students in the College of Chemistry are required to complete the University requirements of American Cultures (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/american-cultures-requirement), American History and Institutions (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/american-history-institutions-requirements), and Entry-Level

Writing (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/entry-level-writing-requirement). In addition, they must satisfy the following College requirements:

Reading and Composition (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/reading-composition-requirement)

In order to provide a solid foundation in reading, writing, and critical thinking the College requires lower division work in composition.

- Chemical Engineering majors: A-level Reading and Composition course (e.g., English R1A) by end of the first year
- Chemical Biology and Chemistry majors: A- and B-level courses by end of the second year (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/reading-composition-requirement)
- R&C courses must be taken for a letter grade
- English courses at other institutions may satisfy the requirement(s); check with your Undergraduate Adviser
- After admission to Berkeley, credit for English at another institution will not be granted if the Entry Level Writing requirement has not been satisfied

Humanities and Social Sciences Breadth Requirement: Chemistry & Chemical Biology majors

The College of Chemistry's humanities and social sciences breadth requirement promotes educational experiences that enrich and complement the technical requirements for each major.

- 15 units total; includes Reading & Composition and American Cultures courses
- Remaining units must come from the following L&S breadth areas, excluding courses which only teach a skill (such as drawing or playing an instrument):

  Arts and Literature
  Foreign Language (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/approved-foreign-language-courses)[1,2]
  Historical Studies
  International Studies
  Philosophy and Values
  Social and Behavioral Sciences

  To find course options for breadth, go to the Berkeley Academic Guide Class Schedule (http://classes.berkeley.edu), select the term of interest, and use the 'Breadth Requirements' filter to select the breadth area(s) of interest.

- Breadth courses may be taken on a *Pass/No Pass* basis (excluding Reading and Composition)
- AP, IB, and GCE A-level exam credit (http://chemistry.berkeley.edu/students/current-undergraduates/exam-credit-info) may be used to satisfy the breadth requirement

[1] Elementary-level courses may not be in the student's native language and may not be structured primarily to teach the reading of scientific literature.

[2] For Chemistry and Chemical Biology majors, elementary-level foreign language courses are not accepted toward the 15 unit breadth requirement if they are used (or are duplicates of high school courses used) to satisfy the Foreign Language requirement.

Foreign Language Requirement

Applies to Chemistry and Chemical Biology majors only.

The Foreign Language requirement may be satisfied with one foreign language, in one of the following ways:

- By completing in high school the third year of one foreign language with minimum grades of C-.
- By completing at Berkeley the second semester of a sequence of courses in one foreign language, or the equivalent at another institution. Only foreign language courses that include reading and composition, as well as conversation, are accepted in satisfaction of this requirement. Foreign language courses may be taken on a Pass/No Pass basis.
- By demonstrating equivalent knowledge of a foreign language through examination, including a College Entrance Examination Board (CEEB) Advanced Placement Examination with a score of 3 or higher (if taken before admission to college), an SAT II: Subject Test with a score of 590 or higher, or a proficiency examination offered by some departments at Berkeley or at another campus of the University of California.

Humanities and Social Sciences Breadth Requirement: Chemical Engineering major

- 22 units total; includes Reading and Composition and American Cultures courses
- Breadth Series requirement: As part of the 22 units, students must complete two courses, at least one being upper division, in the same or very closely allied humanities or social science department(s). AP credit may be used to satisfy the lower division aspect of the requirement.
- Breadth Series courses and all remaining units must come from the following lists of approved humanities and social science courses, excluding courses which only teach a skill (such as drawing or playing an instrument):

  Arts and Literature
  Foreign Language (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/chemistry/approved-foreign-language-courses)[1,2]
  Historical Studies
  International Studies
  Philosophy and Values

  To find course options for breadth, go to the Berkeley Academic Guide Class Schedule (http://classes.berkeley.edu), select the term of interest, and use the 'Breadth Requirements' filter to select the breadth area(s) of interest.

- Breadth courses may be taken on a *Pass/No Pass* basis (excluding Reading and Composition)
- AP, IB, and GCE A-level exam (http://chemistry.berkeley.edu/students/current-undergraduates/exam-credit-info) credit may be used to satisfy the breadth requirement

[1] Elementary-level courses may not be in the student's native language and may not be structured primarily to teach the reading of scientific literature.

[2] For chemical engineering majors, no more that six units of foreign language may be counted toward the 22 unit breadth requirement.

Class Schedule Requirements

- Minimum units per semester: 13
- Maximum units per semester: 19.5
- 12 units of course work each semester must satisfy degree requirements
- Chemical Engineering freshmen and Chemistry majors are required to enroll in a minimum of one chemistry course each semester
- After the freshman year, Chemical Engineering majors must enroll in a minimum of one chemical and biomolecular engineering course each semester

Semester Limit

- Students who entered as freshmen: 8 semesters
- Chemistry & Chemical Biology majors who entered as transfer students: 4 semesters
- Chemical Engineering and Joint majors who entered as transfer students: 5 semesters

Summer sessions are excluded when determining the limit on semesters. Students who wish to delay graduation to complete a minor, a double major, or simultaneous degrees must request approval for delay of graduation before what would normally be their final two semesters. The College of Chemistry does not have a rule regarding maximum units that a student can accumulate.

Senior Residence

After 90 units toward the bachelor's degree have been completed, at least 24 of the remaining units must be completed in residence in the College of Chemistry, in at least two semesters (the semester in which the 90 units are exceeded, plus at least one additional semester).

To count as a semester of residence for this requirement, a program must include at least 4 units of successfully completed courses. A summer session can be credited as a semester in residence if this minimum unit requirement is satisfied.

Juniors and seniors who participate in the UC Education Abroad Program (EAP) for a *full year*#may meet a modified senior residence requirement. After 60 units toward the bachelor's degree have been completed, at least 24 (excluding EAP) of the remaining units must be completed in residence in the College of Chemistry, in at least two semesters. At least 12 of the 24 units must be completed after the student has already completed 90 units. Undergraduate Dean's approval for the modified senior residence requirement must be obtained before enrollment in the Education Abroad Program.

Minimum Total Units

A student must successfully complete at least 120 semester units in order to graduate.

Minimum Academic Requirements

A student must earn at least a C average (2.0 GPA) in all courses undertaken at UC, including those from UC Summer Sessions, UC Education Abroad Program, and UC Berkeley Washington Program, as well as XB courses from University Extension.

Minimum Course Grade Requirements

Students in the College of Chemistry who receive a grade of D+ or lower in a chemical and biomolecular engineering or chemistry course for which a grade of C- or higher is required must repeat the course at Berkeley.

Students in the College of Chemistry must achieve:

- C- or higher in CHEM 4A (http://guide.berkeley.edu/search/?P=CHEM%204A) before taking CHEM 4B (http://guide.berkeley.edu/search/?P=CHEM%204B)
- C- or higher in CHEM 4B (http://guide.berkeley.edu/search/?P=CHEM%204B) before taking more advanced courses
- C- or higher in CHEM 12A (http://guide.berkeley.edu/search/?P=CHEM%2012A) before taking CHEM 12B (http://guide.berkeley.edu/search/?P=CHEM%2012B)
- GPA of at least 2.0 in all courses taken in the college in order to advance to and continue in the upper division

Chemistry or chemical biology majors must also achieve:

- C- or higher in CHEM 120A (http://guide.berkeley.edu/search/?P=CHEM%20120A) and CHEM 120B (http://guide.berkeley.edu/search/?P=CHEM%20120B) if taken before CHEM 125 (http://guide.berkeley.edu/search/?P=CHEM%20125) or CHEM C182 (http://guide.berkeley.edu/search/?P=CHEM%20C182)
- 2.0 GPA in all upper division courses taken at the University to satisfy major requirements

Chemical engineering students must also achieve:

- C- or higher in CHM ENG 140 (http://guide.berkeley.edu/search/?P=CHM%20ENG%20140) before taking any other CBE courses
- C- or higher in CHM ENG 150A (http://guide.berkeley.edu/search/?P=CHM%20ENG%20150A) to be eligible to take any other course in the 150 series
- 2.0 GPA in all upper division courses taken at the University to satisfy major requirements

Chemical engineering students who do not achieve a grade of C- or higher in CHM ENG 140 (http://guide.berkeley.edu/search/?P=CHM%20ENG%20140) on their first attempt are advised to change to another major. If the course is not passed with a grade of C- or higher on the second attempt, continuation in the Chemical Engineering program is normally not allowed.

Minimum Progress

To make normal progress toward a degree, undergraduates must successfully complete 30 units of coursework each year. The continued enrollment of students who do not maintain normal progress will be subject to the approval of the Undergraduate Dean. To achieve minimum academic progress, the student must meet two criteria:

1. Completed no fewer units than 15 multiplied by the number of semesters, less one, in which the student has been enrolled at Berkeley. Summer sessions do not count as semesters for this purpose.
2. A student's class schedule must contain at least 13 units in any term, unless otherwise authorized by the staff adviser or the Undergraduate Dean.

University of California Requirements

Entry Level Writing (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/natural-resources/entry-level-writing-requirement)

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

American History and American Institutions (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/natural-resources/american-history-institutions-requirement)

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

Campus Requirement

American Cultures (http://guide.berkeley.edu/archive/2018-19/undergraduate/colleges-schools/natural-resources/american-cultures-requirement)

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

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
MATH 1A		4	MATH 1B	4
CHEM 4A or 1A ***and*** 1AL		4	ENGIN 7	4
English R1A or equivalent		4	PHYSICS 7A	4
Breadth Elective		3	CHEM 4B or 1B	4
		15		**16**

				Sophomore
	Fall	Units	Spring	Units
PHYSICS 7B		4	MATH 54	4
MATH 53		4	PHYSICS 7C	4
CHM ENG 140		4	CHM ENG 141	4
Breadth Elective		3	CHM ENG 150	4
		15		**16**

				Junior
	Fall	Units	Spring	Units
ENGIN 117		3	NUC ENG 104	4
NUC ENG 101		4	Breadth Elective or CHM ENG 185	6
CHM ENG 142		4	Up to 3 units of Breadth can be satisfied by CHM ENG 185	
CHM ENG 150B		4	NUC ENG 162 or BIOLOGY 1A	3
MAT SCI 45		3	NUC ENG 150	4
MAT SCI 45L		1		
		19		**17**

				Senior
	Fall	Units	Spring	Units
Nuclear Engineering Electives		6	CHM ENG 160 or NUC ENG 170A	3-4
CHEM 120A or PHYSICS 137A		3-4	CHM ENG 162	4
CHM ENG 154		4	Breadth Electives	6
Upper Division Engineering Elective		3-4		
		16-18		**13-14**

Total Units: 127-130

Chemical Engineering

MISSION

The goals of chemical engineering breadth requirements are to teach the arts of writing clearly and persuasively, to develop the skills to read carefully and evaluate evidence effectively, and to instill an awareness of humanity in historical and social contexts. The Berkeley American Cultures requirement affirms the value of diversity in acquiring knowledge.

The technical curriculum in chemical engineering seeks to provide students with a broad education emphasizing an excellent foundation in scientific and engineering fundamentals.

LEARNING GOALS

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multidisciplinary teams.

5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for and an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Nuclear Engineering

Mission

The mission of the Department of Nuclear Engineering is to maintain and strengthen the University of California's only center of excellence in nuclear engineering education and research and to serve California and the nation by improving and applying nuclear science and technology. The mission of the undergraduate degree program in Nuclear Engineering is to prepare our students to begin a lifetime of technical achievement and professional leadership in academia, government, the national laboratories, and industry.

Learning Goals

The foundation of the UC Berkeley Nuclear Engineering (NE) program is a set of five key objectives for educating undergraduate students. The NE program continuously reviews these objectives internally to ensure that they meet the current needs of the students, and each spring the Program Advisory Committee meets to review the program and recommend changes to better serve students. The NE Program Advisory Committee was established in 1988 and is composed of senior leaders from industry, the national laboratories, and academia.

Nuclear engineering at UC Berkeley prepares undergraduate students for employment or advanced studies with four primary constituencies: industry, the national laboratories, state and federal agencies, and academia (graduate research programs). Graduate research programs are the dominant constituency. From 2000 to 2005, sixty-eight percent of graduating NE seniors indicated plans to attend graduate school in their senior exit surveys. To meet the needs of these constituencies, the objectives of the NE undergraduate program are to produce graduates who as practicing engineers and researchers do the following:

1. Apply solid knowledge of the fundamental mathematics and natural (both physical and biological) sciences that provide the foundation for engineering applications.
2. Demonstrate an understanding of nuclear processes, and the application of general natural science and engineering principles to the analysis and design of nuclear and related systems of current and/or future importance to society.
3. Exhibit strong, independent learning, analytical and problem-solving skills, with special emphasis on design, communication, and an ability to work in teams.
4. Demonstrate an understanding of the broad social, ethical, safety, and environmental context within which nuclear engineering is practiced.
5. Value and practice life-long learning.

Chemical Engineering/Nuclear Engineering

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

CHM ENG 24 Freshman Seminars 1 Unit

Terms offered: Spring 2020, Spring 2019, Spring 2015
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Freshman Seminars: Read More [+]
Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular 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 [-]

CHM ENG 40 Introduction to Chemical Engineering Design 2 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Design and analysis of processes involving chemical change. Strategies for design, such as creative thinking and (re)definition of the design goal. Methods for analyzing designs, such as mathematical modeling, empirical analysis by graphics, and dynamic scaling by dimensional analysis. Design choices in light of process efficiency, product quality, economics, safety, and environmental issues.
Introduction to Chemical Engineering Design: Read More [+]
Rules & Requirements

Prerequisites: Math 1B OR Chem 4A

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Introduction to Chemical Engineering Design: Read Less [-]

CHM ENG 84 Sophomore Seminar 1 or 2 Units

Terms offered: Spring 2013, Spring 2012, Spring 2010
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 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 - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Chemical & Biomolecular 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 [-]

CHM ENG 90 Science and Engineering of Sustainable Energy 3 Units

Terms offered: Spring 2020, Spring 2019, Spring 2018
An introduction is given to the science and technologies of producing electricity and transportation fuels from renewable energy resources (biomass, geothermal, solar, wind, and wave). Students will be introduced to quantitative calculations and comparisions of energy technologies together with the economic and political factors affecting the transition from nonrenewable to sustainable energy resources. Mass and energy balances are used to analyze the conversion of energy resources.
Science and Engineering of Sustainable Energy: Read More [+]
Rules & Requirements

Prerequisites: Chemistry 1A or 4A

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructors: Bell, Segalman

Science and Engineering of Sustainable Energy: Read Less [-]

CHM ENG 98 Directed Group Studies for Lower Division Undergraduates 1 - 3 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Supervised research on a specific topic.
Directed Group Studies for Lower Division Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

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

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

Hours & Format

Fall and/or spring: 15 weeks - 1-3 hours of directed group study per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

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

CHM ENG 98W Directed Group Study 1 Unit

Terms offered: Fall 2015
Directed group study consisting of supplementary problem sets, review sessions, and discussions related to chemical engineering. Topics vary with instructor.
Directed Group Study: Read More [+]
Rules & Requirements

Prerequisites: This Chemical Engineering 98W is planned for students who are concurrently enrolled in Chemical Engineering 140

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

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Directed Group Study: Read Less [-]

CHM ENG 140 Introduction to Chemical Process Analysis 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Material and energy balances applied to chemical process systems. Determination of thermodynamic properties needed for such calculations. Sources of data. Calculation procedures.
Introduction to Chemical Process Analysis: Read More [+]
Rules & Requirements

Prerequisites: Chemical Engineering 40 and Chemistry 4B (may be taken concurrently) or Chemistry 1B; and Physics 7B (may be taken concurrently)

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Introduction to Chemical Process Analysis: Read Less [-]

CHM ENG 141 Chemical Engineering Thermodynamics 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Thermodynamic behavior of pure substances and mixtures. Properties of solutions, phase equilibria. Thermodynamic cycles. Chemical equilibria for homogeneous and heterogeneous systems.
Chemical Engineering Thermodynamics: Read More [+]
Rules & Requirements

Prerequisites: 140 with a grade of C- or higher; Engineering 7, which may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Chemical Engineering Thermodynamics: Read Less [-]

CHM ENG 142 Chemical Kinetics and Reaction Engineering 4 Units

Terms offered: Spring 2020, Fall 2019, Fall 2018
Analysis and prediction of rates of chemical conversion in flow and nonflow processes involving homogeneous and heterogeneous systems.
Chemical Kinetics and Reaction Engineering: Read More [+]
Rules & Requirements

Prerequisites: 141 with a grade of C- or higher; 150B, which may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Chemical Kinetics and Reaction Engineering: Read Less [-]

CHM ENG 143 Computational Methods in Chemical Engineering 4 Units

Terms offered: Spring 2020, Spring 2019, Spring 2016
The purpose of Chemical Engineering Modeling and Computations in Chemical Engineering is to teach students the methodologies used in setting up mathematical models of simple chemical processes and operations, and the numerical techniques used to simulate them. Included are techniques to obtain physical properties of mixtures/solutions using equations of state. This is followed by simple processes such as vapor liquid equilibrium, separation operations such as distillation, heat transfer, and chemical reactions in ideal reactors such as stirred tank and plug flow. Later on, real chemical process equipment and processes are modeled and simulated, using many of the techniques learned earlier. Programming languages such as Matlab and...
Computational Methods in Chemical Engineering: Read More [+]
Objectives Outcomes

Course Objectives: The focus of this course is on developing insights into chemical processes and operations through the use of modeling and computations. This is not a programming course. The instructors will provide introduction to the use of Aspen and the other codes, but the majority of the learning will be through the active use of these programs by the students in solving assigned problems.

Student Learning Outcomes: The course will be consistent with the overall objectives of the Chemical Engineering curriculum as outlined in the ABET guidelines.

Rules & Requirements

Prerequisites: E7 and CHM ENG 140

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/Undergraduate

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

Computational Methods in Chemical Engineering: Read Less [-]

CHM ENG 150A Transport Processes 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Principles of fluid mechanics and heat transfer with application to chemical processes. Laminar and turbulent flow in pipes and around submerged objects. Flow measurement. Heat conduction and convection; heat transfer coefficients.
Transport Processes: Read More [+]
Rules & Requirements

Prerequisites: 140 with a grade of C- or higher; Math 54, which may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/Undergraduate

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

Transport Processes: Read Less [-]

CHM ENG 150B Transport and Separation Processes 4 Units

Terms offered: Spring 2020, Fall 2019, Fall 2018
Principles of mass transfer with application to chemical processes. Diffusion and convection. Simultaneous heat and mass transfer; mass transfer coefficients. Design of staged and continuous separations processes.
Transport and Separation Processes: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 141 with a grade of C- or higher; Chemical and Biomolecular Engineering 150A with a grade of C- or higher; Engineering 7

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: Chemical & Biomolecular Engineering/Undergraduate

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

Transport and Separation Processes: Read Less [-]

CHM ENG 154 Chemical Engineering Laboratory 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Experiments in physical measurements, fluid mechanics, heat and mass transfer, kinetics, and separation processes. Emphasis on investigation of basic relationships important in engineering. Experimental design, analysis of results, and preparation of engineering reports are stressed.
Chemical Engineering Laboratory: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 141, 142, and 150B

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 8 hours of laboratory per week

Summer: 8 weeks - 2 hours of lecture and 16 hours of laboratory per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Chemical Engineering Laboratory: Read Less [-]

CHM ENG 160 Chemical Process Design 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Design principles of chemical process equipment. Design of integrated chemical processes with emphasis upon economic considerations.
Chemical Process Design: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 142, 150B, and 154. 154 can be taken concurrently

Hours & Format

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

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Chemical Process Design: Read Less [-]

CHM ENG 161S Industrial Chemical Process Design 6 Units

Terms offered: Prior to 2007
Design of chemical processes and equipment, with an emphasis on industry-sponsored and/or industry-tailored processes
Industrial Chemical Process Design: Read More [+]
Objectives Outcomes

Course Objectives: Teach students the strategies used in the design of chemical processes through an authentic industrial project.

Student Learning Outcomes: • Develop an ability to function on multi-disciplinary teams.
• Develop the ability to design an integrated chemical engineering-based process to meet stated objectives within realistic constraints.
• Establish proficiency in the design process and project management fundamentals.
• Gain an understanding of professional and ethical responsibilities.

Rules & Requirements

Prerequisites: Prerequisites: Chemical and Biomolecular Engineering 142, 150B, and 154

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructors: Bryan, Sciamanna

Industrial Chemical Process Design: Read Less [-]

CHM ENG 162 Dynamics and Control of Chemical Processes 4 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Analysis of the dynamic behavior of chemical processes and methods and theory of their control. Implementation of computer control systems on process simulations.
Dynamics and Control of Chemical Processes: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 142 and 150B; Mathematics 53 and 54

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Dynamics and Control of Chemical Processes: Read Less [-]

CHM ENG 170A Biochemical Engineering 3 Units

Terms offered: Fall 2019, Fall 2018, Fall 2016
This course intends to introduce chemical engineers to the basic concepts of biochemical engineering. The course focuses on the use of chemical engineering skills and principles in the analysis and design of biologically-based processes. The main emphasis will be on biochemical kinetics, heat and mass transfer, thermodynamics, and transport phenomena as they apply to enzyme catalysis, microbial growth and metabolism, fermentation and bioreactor design, product recovery and downstream processing. Fundamental topics in biological sciences will be introduced as necessary throughout the course.
Biochemical Engineering: Read More [+]

Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 142, 150B, or consent of instructor; Biology 1A

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructor: Clark

Biochemical Engineering: Read Less [-]

CHM ENG 170B Biochemical Engineering 3 Units

Terms offered: Spring 2020, Spring 2019, Spring 2014
The second of a two-semester sequence intended to introduce chemical engineers to the basic concepts of biochemical engineering. The course focuses on the use of chemical engineering skills and principles in the analysis and design of biologically-based processes. The emphasis will be on biochemical kinetics, protein engineering, cell growth and metabolism, bioreactor design, downstream processing, pharmacokinetics, drug delivery, and ethics.
Biochemical Engineering: Read More [+]

Rules & Requirements

Prerequisites: 170A: Chemistry 135 or Molecular and Cell Biology 102, which may be taken concurrently

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructor: Clark

Formerly known as: 170

Biochemical Engineering: Read Less [-]

CHM ENG C170L Biochemical Engineering Laboratory 3 Units

Terms offered: Spring 2020, Spring 2019, Fall 2018, Spring 2014, Spring 2013
Laboratory techniques for the cultivation of microorganisms in batch and continuous reactions. Enzymatic conversion processes. Recovery of biological products.
Biochemical Engineering Laboratory: Read More [+]

Rules & Requirements

Prerequisites: Chemical Engineering 170A (may be taken concurrently) or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 7 hours of laboratory and 1 hour of lecture per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Also listed as: CHEM C170L

Biochemical Engineering Laboratory: Read Less [-]

CHM ENG 171 Transport Phenomena 3 Units

Terms offered: Fall 2018, Spring 2011, Spring 2009
Study of momentum, energy, and mass transfer in laminar and turbulent flow.
Transport Phenomena: Read More [+]
Rules & Requirements

Prerequisites: 150B

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Transport Phenomena: Read Less [-]

CHM ENG 176 Principles of Electrochemical Processes 3 Units

Terms offered: Spring 2019, Spring 2018, Fall 2016
Principles and application of electrochemical equilibria, kinetics, and transport processes. Technical electrolysis and electrochemical energy conversion.
Principles of Electrochemical Processes: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 141, 142, and 150B

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Principles of Electrochemical Processes: Read Less [-]

CHM ENG C178 Polymer Science and Technology 3 Units

Terms offered: Spring 2020, Spring 2019, Spring 2018, Fall 2016, Spring 2016, Spring 2015
An interdisciplinary course on the synthesis, characterization, and properties of polymer materials. Emphasis on the molecular origin of properties of polymeric materials and technological applications. Topics include single molecule properties, polymer mixtures and solutions, melts, glasses, elastomers, and crystals. Experiments in polymer synthesis, characterization, and physical properties.
Polymer Science and Technology: Read More [+]
Rules & Requirements

Prerequisites: Junior standing

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Also listed as: CHEM C178

Polymer Science and Technology: Read Less [-]

CHM ENG 179 Process Technology of Solid-State Materials Devices 3 Units

Terms offered: Fall 2019, Fall 2018, Fall 2017
Chemical processing and properties of solid-state materials. Crystal growth and purification. Thin film technology. Application of chemical processing to the manufacture of semiconductors and solid-state devices.
Process Technology of Solid-State Materials Devices: Read More [+]
Rules & Requirements

Prerequisites: Engineering 45; one course in electronic circuits recommended; senior standing

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Process Technology of Solid-State Materials Devices: Read Less [-]

CHM ENG 180 Chemical Engineering Economics 3 Units

Terms offered: Fall 2019, Spring 2019, Fall 2017
Optimal design of chemical processes and unit operations, emphasizing the interactions between technical and economic considerations. Analysis of process risks. Chemical and biomolecular process design in the presence of uncertainties. Interest rate determinants and their effects on chemical process feasibility and choices. Relationships between structure and behavior of firms in the chemical processing industries. Multivariable input-output analyses.
Chemical Engineering Economics: Read More [+]
Rules & Requirements

Prerequisites: Chemical and Biomolecular Engineering 142 and 150B. Consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Chemical Engineering Economics: Read Less [-]

CHM ENG 182 Nanoscience and Engineering Biotechnology 3 Units

Terms offered: Spring 2020, Fall 2018
This nanoscale science and biomolecular engineering course will cover emerging topics in applied biotechnology and nanotechnology. Topics include enzyme kinetics, enzyme inhibition, recombinant protein generation, cell culture, genome editing, drug design, nanoparticle-based gene and drug delivery, fluorescence imaging, and sensors. The course will also probe the interface of biology with nanomaterials, and standard microscopic techniques to image biological structures and nanoscale materials.
Nanoscience and Engineering Biotechnology: Read More [+]
Rules & Requirements

Prerequisites: Bio 1A or BioE 11 and Physics 7A

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructor: Landry

Nanoscience and Engineering Biotechnology: Read Less [-]

CHM ENG H193 Senior Honors Thesis 3 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015
A senior honors thesis is written in consultation with the student's faculty research advisor. This is a required course for students wishing to graduate with honors in Chemical Engineering.
Senior Honors Thesis: Read More [+]
Rules & Requirements

Prerequisites: Senior standing, approval of faculty research advisor, overall GPA of 3.4 or higher

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Senior Honors Thesis: Read Less [-]

CHM ENG H194 Research for Advanced Undergraduates 2 - 4 Units

Terms offered: Spring 2020, Spring 2019, Summer 2016 10 Week Session
Original research under direction of one of the members of the staff.
Research for Advanced Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Minimum GPA of 3.4 overall at Berkeley and consent of instructor

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

Hours & Format

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

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Research for Advanced Undergraduates: Read Less [-]

CHM ENG 195 Special Topics 2 - 4 Units

Terms offered: Fall 2019, Fall 2018, Fall 2017
Lectures and/or tutorial instruction on special topics. Please refer to the Notes section in the Academic Guide for the current course description.
Special Topics: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

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

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of independent study per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Special Topics: Read Less [-]

CHM ENG C195A The Berkeley Lectures on Energy: Energy from Biomass 3 Units

Terms offered: Fall 2015, Fall 2014, Fall 2013
After an introduction to the different aspects of our global energy consumption, the course will focus on the role of biomass. The course will illustrate how the global scale of energy guides the biomass research. Emphasis will be placed on the integration of the biological aspects (crop selection, harvesting, storage and distribution, and chemical composition of biomass) with the chemical aspects to convert biomass to energy. The course aims to engage students in state-of-the-art research.
The Berkeley Lectures on Energy: Energy from Biomass: Read More [+]
Rules & Requirements

Prerequisites: Chemistry 1B or Chemistry 4B, Mathematics 1B, Biology 1A

Repeat rules: Course may be repeated for credit under special circumstances: Repeatable when topic changes with consent of instructor.

Hours & Format

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructors: Bell, Blanch, Clark, Smit, C. Somerville

Also listed as: BIO ENG C181/CHEM C138/PLANTBI C124

The Berkeley Lectures on Energy: Energy from Biomass: Read Less [-]

CHM ENG 196 Special Laboratory Study 2 - 4 Units

Terms offered: Spring 2020, Spring 2019, Spring 2016
Special laboratory or computational work under direction of one of the members of the staff.
Special Laboratory Study: Read More [+]
Rules & Requirements

Prerequisites: Consent of instructor

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

Hours & Format

Fall and/or spring: 15 weeks - 2-3 hours of independent study per week

Summer:
6 weeks - 5-8 hours of independent study per week
8 weeks - 3.5-6 hours of independent study per week
10 weeks - 3-4.5 hours of independent study per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Special Laboratory Study: Read Less [-]

CHM ENG 197 Field Study in Chemical Engineering 1 - 4 Units

Terms offered: Spring 2020, Spring 2016, Fall 2015
Supervised experience in off-campus organizations relevant to specific aspects and applications of chemical engineering. Written report required at the end of the term. Course does not satisfy unit or residence requirements for the bachelor's degree.
Field Study in Chemical Engineering: Read More [+]
Rules & Requirements

Prerequisites: Upper division standing and consent of instructor

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

Hours & Format

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

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Instructor: Strauss

Field Study in Chemical Engineering: Read Less [-]

CHM ENG 198 Directed Group Study for Undergraduates 1 - 3 Units

Terms offered: Spring 2020, Fall 2019, Spring 2019
Supervised research on a specific topic. Enrollment is restricted; see Introduction to Courses and Curricula section in the General Catalog.
Directed Group Study for Undergraduates: Read More [+]
Rules & Requirements

Prerequisites: Completion of 60 units of undergraduate study and in good academic standing

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

Hours & Format

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

Summer: 6 weeks - 2.5-7.5 hours of lecture per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Directed Group Study for Undergraduates: Read Less [-]

CHM ENG 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Spring 2016, Fall 2015, Spring 2015
Supervised Independent Study and Research: Read More [+]
Rules & Requirements

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

Hours & Format

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

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

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

Supervised Independent Study and Research: Read Less [-]

Nuclear Engineering

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

NUC ENG 24 Freshman Seminars 1 Unit

Terms offered: Spring 2020, Fall 2019, Spring 2019
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Freshman Seminars: Read More [+]
Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: 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 Energy and Technology 3 Units

Terms offered: Fall 2019, Spring 2018, Spring 2017
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 Energy and Technology: Read More [+]
Rules & Requirements

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

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: Fratoni

Introduction to Nuclear Energy and Technology: Read Less [-]

NUC ENG 101 Nuclear Reactions and Radiation 4 Units

Terms offered: Spring 2020, Fall 2018, Fall 2017
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 and NUC ENG 100

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: NUC ENG 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 2019, Spring 2018, Spring 2017
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 experiements being performed.
Radiation Detection and Nuclear Instrumentation Laboratory: Read More [+]
Rules & Requirements

Prerequisites: NUC ENG 101 or consent of instructor; NUC ENG 150 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 2018, Fall 2016, Fall 2014
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: NUC ENG 101 and NUC ENG 104

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 2019, Fall 2018, Fall 2017
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: MAT SCI 45 and one of the following: ENGIN 40, MEC ENG 40, or CHM ENG 141

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 2020, Spring 2019, Spring 2017
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: NUC ENG 100

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 2020, Spring 2019, Spring 2018
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: NUC ENG 101 (or similar background 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 2020, Spring 2019, Spring 2018
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: MATH 53, MATH 54, and NUC ENG 100

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: Fall 2019, Spring 2019, Spring 2018
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: MATH 53, MATH 54, and ENGIN 7

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 156 Nuclear Criticality Safety 3 Units

Terms offered: Fall 2019, Fall 2018
This course provides an introduction to the field of nuclear criticality safety. Topics include: a review of basic concepts related to criticality (fission, cross sections, multiplication factor, etc.); criticality safety accidents; standards applicable to criticality safety; hand calculations and Monte Carlo methods used in criticality safety analysis; criticality safety evaluation documents.
Nuclear Criticality Safety: Read More [+]

Objectives Outcomes

Course Objectives: The objective of this course is to acquaint Nuclear Engineering students with the concepts and practice of nuclear criticality safety, and to help prepare them for a future career in this field.

Student Learning Outcomes: At the end of this course, students should be able to:
Explain and define criticality safety factors for operations.
Discuss previous criticality accidents and their causal factors, including parameters involved in solution and metal critical accidents.
Identify and discuss the application of several common hand calculation methods.
Describe the importance of validation of computer codes and how it is accomplished.
Discuss ANSI/ANS criticality safety regulations.
Describe DOE regulations and practices in the nuclear criticality safety field.
Complete a Criticality Safety Evaluation.

Rules & Requirements

Prerequisites: NUC ENG 150 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. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

Instructor: Fratoni

Nuclear Criticality Safety: Read Less [-]

NUC ENG 161 Nuclear Power Engineering 4 Units

Terms offered: Fall 2019, Fall 2018, Fall 2017
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 (MEC ENG 106 and MEC ENG 109; or CHM ENG 150A); Course in Thermodynamics (ENGIN 40, MEC ENG 40, or CHM ENG 141)

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 2020, Spring 2019, Spring 2018
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 2019, Fall 2017, Fall 2015
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. Choose from the following: CHM ENG 150A, CHM ENG 180, CIV ENG 111, CIV ENG 120, CIV ENG 152, CIV ENG 166, CIV ENG 175, ENGIN 120, IND ENG 166, IND ENG 172, MEC ENG 106, MEC ENG 109, MEC ENG C134 / EL ENG C128, MEC ENG 146, NUC ENG 120, NUC ENG 124, NUC ENG 150, and NUC ENG 161

Hours & Format

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

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

Terms offered: Spring 2020, Spring 2019, Spring 2018
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: Senior standing

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 2018, Fall 2013, Fall 2011
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 2019, Fall 2018, Fall 2017
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: Summer 2020 10 Week Session, Spring 2020, Fall 2019
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 up to a total 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 2020, Fall 2019, Spring 2019
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 without restriction.

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 2020, Fall 2019, Spring 2019
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.

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

Hours & Format

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

Summer:
6 weeks - 1-5 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.

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

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 [-]