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

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 (https://guide.berkeley.edu/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	Course Not Available	4
MATH 1B	Course Not Available	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations	4
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	5
or CHEM 4A	General Chemistry and Quantitative Analysis	
CHEM 1B	General Chemistry	4
or CHEM 4B	General Chemistry and Quantitative Analysis	
PHYSICS 7A	Physics for Scientists and Engineers	4
PHYSICS 7B	Physics for Scientists and Engineers	4
PHYSICS 7C	Physics for Scientists and Engineers	4
ENGIN 7	Introduction to Computer Programming and Numerical Methods	4
or COMPSCI 61	The Structure and Interpretation of Computer Programs	
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 130	Mathematics and Statistics in Chemical Engineering	4
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
or CHM ENG C	Biochemical Engineering Laboratory	
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
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/undergraduate/colleges-schools/chemistry/american-

cultures-requirement/), American History and Institutions (http://guide.berkeley.edu/undergraduate/colleges-schools/chemistry/american-history-institutions-requirements/), and Entry-Level Writing (http://guide.berkeley.edu/undergraduate/colleges-schools/chemistry/entry-level-writing-requirement/). In addition, they must satisfy the following College requirements:

Reading and Composition (https://guide.berkeley.edu/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 (https://guide.berkeley.edu/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/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 (Language Other Than English [LOTE]) Requirement

Applies to Chemistry and Chemical Biology majors only.

The LOTE requirement may be satisfied with one language other than English, in one of the following ways:

- By completing in high school the third year of one language other than English with minimum grades of C-.
- By completing at Berkeley the second semester of a sequence of courses in one language other than English, or the equivalent at another institution. Only LOTE courses that include reading and composition, as well as conversation, are accepted in satisfaction of this requirement. LOTE courses may be taken on a Pass/No Pass basis.
- By demonstrating equivalent knowledge of a language other than English 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/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 language other than English 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 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 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 before taking CHEM 4B
- C- or higher in CHEM 4B before taking more advanced courses
- C- or higher in CHEM 12A before taking CHEM 12B
- 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 and CHEM 120B if taken before CHEM 125 or CHEM C182
- 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 before taking any other CBE courses
- C- or higher in CHM ENG 150A 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 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 (https://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

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

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

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

Campus Requirement

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

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

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

Freshman

Fall	Units	Spring	Units
MATH 1A	4	MATH 1B	4
CHEM 4A or 1A ***and*** 1AL	5	CHEM 4B	5
English R1A or equivalent	4	PHYSICS 7A	4
Breadth Elective	3-4	ENGIN 7 or COMPSCI 61A	4
	16-17		**17**

Sophomore

Fall	Units	Spring	Units
MATH 53	4	MATH 54	4
PHYSICS 7B	4	PHYSICS 7C	4
CHM ENG 130	4	CHM ENG 141	4
CHM ENG 140	4	CHM ENG 150	4
	16		**16**

Junior

Fall	Units	Spring	Units
MAT SCI 45	3	NUC ENG 104	4
MAT SCI 45L	1	NUC ENG 150	4
NUC ENG 101	4	NUC ENG 162 or BIOLOGY 1A	3
CHM ENG 142	4	Breadth Electives	3-4
CHM ENG 150B	4		
	16		**14-15**

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 or C170L	3-4	Breadth Electives	6-8
Breadth Elective	3-4	Upper Division Engineering Elective	3-4
	15-18		**16-20**

Total Units: 126-135

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 identify, formulate, and solve complx engineering problems by applying the principles of engineering, science, and mathematics

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. An ability to communicate effectively with a range of audiences

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in a global, economic, environmental, and societal context

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

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

CHM ENG 24 Freshman Seminars 1 Unit

Terms offered: Spring 2022, Spring 2020, 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.

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.

CHM ENG 40 Introduction to Chemical Engineering Design 2 Units

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

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.

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.

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.

CHM ENG 90 Science and Engineering of Sustainable Energy 3 Units

Terms offered: Spring 2023, Spring 2022, Spring 2021
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.

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

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

Terms offered: Spring 2025, Fall 2024, Spring 2023
Supervised research on a specific topic.

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.

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.

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.

CHM ENG 101 Chemical Business Fundamentals I 4 Units

Terms offered: Prior to 2007

This upper division course for science and engineering students is the first of a two-course series that covers the business fundamentals for technology professionals. This course is only offered as part of a four-course summer minor program in Responsible Process Implementation within the Department of Chemical & Biomolecular Engineering. Through the use of applicable cases and examples from the chemical and process industries, students will learn the basic concept of business and the role that technology professionals are expected to play in a business environment.

Hours & Format

Summer: 6 weeks - 10 hours of lecture and 3 hours of discussion 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.).

CHM ENG 102 Chemical Business Fundamentals II 4 Units

Terms offered: Prior to 2007

This upper division course for science and engineering students is the continuation of a two-course series that covers the business fundamentals for technology professionals. This course is only offered as part of a four-course summer minor program in Responsible Process Implementation within the Department of Chemical & Biomolecular Engineering. It is intended to introduce the marketing, product development, and operational aspects of a business enterprise, to help technology professionals optimize their effectiveness when performing their duties within a multifunctional organization, and to illuminate the effects of their actions and decisions on the performance of a business entity.

Rules & Requirements

Prerequisites: CHMENG S101

Hours & Format

Summer: 6 weeks - 10 hours of lecture and 3 hours of discussion 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.).

CHM ENG 103 New Process Implementation: Concept to Commercialization 3 Units

Terms offered: Prior to 2007

This upper division course for science and engineering students is to be taken in the second 6-week summer session of the summer minor program in Responsible Process Implementation within the Department of Chemical & Biomolecular Engineering. Students will use all of the materials presented in this program to address process design and control challenges. Specifically, they will learn how to make process design and control decisions that satisfy all of the technical requirements and optimize the economic benefits while addressing the ethical, environmental, and social impact.

Rules & Requirements

Prerequisites: CHM ENG 101 & CHM 101

Hours & Format

Summer: 6 weeks - 10 hours of lecture and 3 hours of discussion 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.).

CHM ENG 104 Ethics and Professional Social Responsibility 1 Unit

Terms offered: Prior to 2007

This upper division course for science and engineering students covers the concept of environmental ethics and responsibility in the chemical industry. This course is only offered as part of a summer minor program in Responsible Process Implementation by the Chemical and Biomolecular Engineering. It is intended to impress upon the importance of professional social responsibilities of engineering decision making. Topics of discussion include corporate citizenship, business and stakeholder relationship, environmental responsibilities, engineering and technology ethics and other key aspects of engineering professional social responsibilities such as social justice, health, safety and welfare of stakeholders.

Rules & Requirements

Prerequisites: CHM ENG 101

Hours & Format

Summer: 6 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. Alternative to final exam.

CHM ENG 130 Mathematics and Statistics in Chemical Engineering 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
The purpose of this course is to teach students the analytical, numerical, and statistical methods required for setting up and solving mathematical problems, with emphasis on CBE applications. Methods for solving algebraic equations, initial value problems, boundary value problems, and partial differential equations, as well as probability theory, will be covered. Programming tools such as Python and Matlab will be used in this course. This is not a programming course. The majority of the learning will be through the active use of these programs by the students in solving assigned problems.

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. Final exam required.

CHM ENG 140 Introduction to Chemical Process Analysis 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
Material and energy balances applied to chemical process systems. Determination of thermodynamic properties needed for such calculations. Sources of data. Calculation procedures.

Rules & Requirements

Prerequisites: 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.

CHM ENG 141 Chemical Engineering Thermodynamics 4 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
Thermodynamic behavior of pure substances and mixtures. Properties of solutions, phase equilibria. Thermodynamic cycles. Chemical equilibria for homogeneous and heterogeneous systems.

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.

CHM ENG 142 Chemical Kinetics and Reaction Engineering 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
Analysis and prediction of rates of chemical conversion in flow and nonflow processes involving homogeneous and heterogeneous systems.

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.

CHM ENG 143 Computational Methods in Chemical Engineering 4 Units

Terms offered: Spring 2025, Spring 2023, Spring 2022
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...
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.

CHM ENG 148 Principles and applications of colloids and interfaces 3 Units

Terms offered: Spring 2025
Interfacial and colloid science deals with the behavior & properties of particles, films, and other systems with large surface to volume ratios. The large interfacial area gives rise to the properties associated with nanotechnology. It is a field that draws from physical chemistry, materials science, and thermodynamics. An objective of the course is to develop your fundamental understanding that will guide your intuition and to help you develop quantitative descriptions applicable to a wide range of problems. Covered are how properties of surfaces, interfaces, and nanoscale features differ from bulk materials. We will discuss fundamental interfacial physics and chemistry, as well as touching on state-of-the-art technologies.
Objectives & Outcomes

Course Objectives: Derive relationships and the formalism to describe the physical manifestations observed in colloidal systems, nanostructured materials, micro/nanoscale devices.
Develop quantitative relationships between the molecular world and macroscopic observations.
Gain a basic understanding of how molecular interactions lead to interfacial phenomena and colloidal behavior.

Student Learning Outcomes: An awareness of contemporary issues which have an impact on the discipline of CBE (xi)
The lectures and problems are based on recent high impact published work or significant technological issues in colloids and interfacial science. The reading material is also based on ongoing important fundamental challenges in interfacial science. The formalism developed in class is put in context of a bigger picture and students are asked to discuss the impact of the work presented within the discipline. For each topic covered the state of the art, the limit of current knowledge, as well as ongoing challenges in the field are discussed in class.

Knowledge of emerging applied science within CBE, attained through electives and/or research (vii)
As an advanced undergraduate course, material is introduced at the textbook level but is quickly translated to emerging applications and innovations through discussion and presentations of the recent research literature.

The ability to apply the fundamentals of chemistry, biology, mathematics and physics to CBE practice (i)
An emphasis is placed on problem solving (homework, and exams) that requires students to apply the principles of chemistry and physics, especially in developing physically meaningful constitutive relationships to describe colloids and interfacial phenomena. Mathematical analysis, derivations, and problem solving strategies are used extensively throughout the course.

The ability to design, conduct, and evaluate experiments, including the analysis and interpretation of data (iv)
A component of the problem sets and questions in exams include giving raw experimental data (with noise and errors) that needs to be analyzed using the formalism developed in the course. The students also discuss experimental results and data presented in recent scientific literature.

The ability to use the techniques, skills, and engineering tools for modern engineering practice (v).
Students routinely need to use numerical methods (python, excel, or matlab) to solve equations, organize data, and plot their results.

CHM ENG 150A Transport Processes 4 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
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.

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.

CHM ENG 150B Transport and Separation Processes 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.

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.

CHM ENG 154 Chemical Engineering Laboratory 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
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.

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.

CHM ENG 160 Chemical Process Design 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
Design principles of chemical process equipment. Design of integrated chemical processes with emphasis upon economic considerations.

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.

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
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

CHM ENG 162 Dynamics and Control of Chemical Processes 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
Analysis of the dynamic behavior of chemical processes and methods and theory of their control. Implementation of computer control systems on process simulations.
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.

CHM ENG 170A Biochemical Engineering 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
This course intends to introduce chemical engineers to the essential concepts of bioprocessing for applications in the biopharmaceutical, industrial biotech, and food tech industries. The course focuses on the use of chemical engineering skills and principles, including but not limited to kinetics and reactor design, thermodynamics and transport phenomena in the analysis and design of biologically-based processes, as well as the economical analysis and ethics. The main emphasis of 170A, the first of a two-semester sequence will be on the upstream bioprocess of how to make products by designing unit operations and processes around living systems of cells.
Rules & Requirements

Prerequisites: BIO ENG 11 or MCB 102 (or equivalent) highly recommended. Chem Eng 150B and Chem Eng 142 or concurrent, or consent of instructor(s)

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.

Instructors: Zhang, Ryder

CHM ENG 170B Biochemical Engineering 4 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
This course intends to introduce chemical engineers to the essential concepts of bioprocessing for applications in the biopharmaceutical, industrial biotech, and food tech industries. The course focuses on the use of chemical engineering skills and principles, including but not limited to kinetics and reactor design, thermodynamics and transport phenomena in the analysis and design of biologically-based processes, as well as the economical analysis and ethics. The main emphasis of 170B, the second of a two-semester sequence will be on the downstream bioprocess of recovery, separations and purification of bio-based products.

Rules & Requirements

Prerequisites: BIO ENG 11 or MCB 102 (or equivalent) highly recommended. Chem Eng 150B and Chem Eng 142 or concurrent, or consent of instructor(s)

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.

Instructors: Zhang, Ryder

Formerly known as: 170

CHM ENG C170L Biochemical Engineering Laboratory 3 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024, 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.

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

CHM ENG 171 Transport Phenomena 3 Units

Terms offered: Spring 2021, Fall 2018, Spring 2011
Study of momentum, energy, and mass transfer in laminar and turbulent flow.

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.

CHM ENG 176 Principles of Electrochemical Processes 3 Units

Terms offered: Spring 2025, Spring 2024, Spring 2022
Principles and application of electrochemical equilibria, kinetics, and transport processes. Technical electrolysis and electrochemical energy conversion.

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.

CHM ENG C178 Polymer Science and Technology 3 Units

Terms offered: Fall 2025, Spring 2025, Spring 2023, 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.

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

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

Terms offered: Fall 2025, Spring 2024, Spring 2023

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.

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.

CHM ENG 180 Chemical Engineering Economics 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2020

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.

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.

CHM ENG 182 Nanoscience and Engineering Biotechnology 3 Units

Terms offered: Fall 2022, Fall 2021, Spring 2020

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.

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

CHM ENG 183 Climate Solutions Technologies 3 Units

Terms offered: Fall 2020

This course for upper division students in science and engineering disciplines covers energy and climate and specific technologies that can be implemented to reduce global warming. Topics include renewable energy (wind and solar), carbon management technologies including Carbon Capture, Utilization and Storage, and Negative Emissions Technologies. The technologies will be described and compared from an upper level chemical engineering perspective that includes fundamental concepts in thermodynamics and separations. We will also cover carbon economics and policies and life-cycle analysis. The course will be framed from a systems-thinking perspective. Throughout the course we will focus on key aspects of communicating climate science.

Objectives & Outcomes

Course Objectives: After taking this course, students should be able to discuss and explain to peers the role of CO2 in the earth's climate, the greenhouse effect, the carbon cycle and how it relates to the fate of greenhouse gases on many time scales, and the role of fossil fuel combustion in the energy landscape and in CO2 emissions.
Students in this class will gain experience in applying principles of systems thinking, engineering design and analysis to specific technologies that are relevant for mitigating climate change in the immediate future.
Students will appreciate the critical role that communication plays in the path to implementation of solutions and will be comfortable engaging in a discussion about climate solutions with technical and non-technical peers.

Students will gain a basic understanding of economics relative to climate policies, and of climate solutions currently being discussed by policymakers; they will gain an understanding of how these individual solutions fit into a global scheme.
Students will gain knowledge about the most current technologies available for producing energy renewably, managing carbon, and reducing atmospheric greenhouse gas concentrations.

Rules & Requirements

Prerequisites: Chem 1A,B or 4A,B, Phys 7A,B, Math 1A,B

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. Alternative to final exam.

Instructor: Went

CHM ENG 186 Fundamental Electrochemistry 3 Units

Terms offered: Summer 2025 First 6 Week Session

Electrochemistry is a field of science that describes the interrelation of chemical and electrical effects. Much of the field deals with describing how chemical changes are caused by the passage of electrical current or how the production of electrical current can be caused by chemical reactions. Electrochemists rely on a foundational understanding of chemical thermodynamics and electrostatics, chemical and electron-transfer kinetics, and mass-transport phenomena – each of which are treated and developed in this course in the context of electrochemical phenomena. Additional topics include electrochemical instrumentation, practical electrochemistry, and electrochemical impedance spectroscopy.

Rules & Requirements

Prerequisites: Undergraduates in CHMENG 186 are generally expected to have completed junior-level courses in their major. CBE majors must have taken CHMENG 142, CHMENG 150B, or CHEM 120A

Hours & Format

Summer: 6 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

CHM ENG 187 Electrochemical Device Engineering 3 Units

Terms offered: Summer 2025 Second 6 Week Session

Electrochemical engineering combines the study of charge transfer at electrode/electrolyte interfaces with the development of practical materials and processes. Electrochemical devices/reactors, their voltage and current distribution, mass-transport, hydrodynamics, geometry, and overall performance in terms of reaction yield, conversion efficiency, and energy efficiency are examined. Electrochemical energy storage (batteries and capacitors), energy conversion (low- and high-temperature fuel cells and electrolyzers), and metal plating and electrosynthesis devices are covered. Fundamental chemistry, physics, and engineering principles that govern device response are emphasized.

Rules & Requirements

Prerequisites: CHMENG 186/286 Advanced Electrochemistry Fundamentals

Hours & Format

Summer: 6 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

CHM ENG 188 Electrochemical Projects Laboratory 3 Units

Terms offered: Summer 2025 Second 6 Week Session
Students work in teams to solve open-ended research and development projects in electrochemical science, engineering, and technology. The projects for the course come from industry partners, national laboratory partners, and academic research laboratories. This allows the students to develop skills solving unstructured problems representative of what they will face in their career. Example projects span electrolysis and fuel cells, interfacial electrochemistry, batteries, and electrosynthesis.
Rules & Requirements

Prerequisites: CHEMENG 186/286 Electrochemistry Fundamentals

Hours & Format

Summer: 6 weeks - 16 hours of laboratory per week

Additional Details

Subject/Course Level: Chemical & Biomolecular Engineering/ Undergraduate

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

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.
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.

CHM ENG H194 Research for Advanced Undergraduates 2 - 4 Units

Terms offered: Fall 2025, Spring 2024, Fall 2023
Original research under direction of one of the members of the staff.
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.

CHM ENG 195 Special Topics 2 - 4 Units

Terms offered: Spring 2021, Spring 2020, Fall 2019
Lectures and/or tutorial instruction on special topics. Please refer to the Notes section in the Academic Guide for the current course description.
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.

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.
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

CHM ENG 196 Special Laboratory Study 2 - 4 Units

Terms offered: Fall 2023, Summer 2023 8 Week Session, Summer 2022 8 Week Session
Special laboratory or computational work under direction of one of the members of the staff.
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.

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

Terms offered: Spring 2023, Spring 2022, Spring 2021
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.
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

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

Terms offered: Spring 2024, Spring 2023, Fall 2022
Supervised research on a specific topic. Enrollment is restricted; see Introduction to Courses and Curricula section in the General Catalog.
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.

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

Terms offered: Spring 2016, Fall 2015, Spring 2015

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.

Nuclear Engineering

NUC ENG 10 What do nuclear engineers do? 1 Unit

Terms offered: Fall 2025, Fall 2024, Fall 2023

This seminar provides freshman and first year transfer students with an overview of the field of nuclear engineering (NE) and the research activities in the NE department. Every week a faculty member will introduce a topic and describe the main research challenges in that area.

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

Instructor: Hosemann

NUC ENG 24 Freshman Seminars 1 Unit

Terms offered: Fall 2025, Spring 2025, Fall 2024

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.

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 To be decided by the instructor when the class is offered.

NUC ENG 100 Introduction to Nuclear Energy and Technology 3 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023

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.

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

NUC ENG 101 Nuclear Reactions and Radiation 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.
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.

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.
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

NUC ENG 104 Radiation Detection and Nuclear Instrumentation Laboratory 4 Units

Terms offered: Spring 2025, Spring 2024, Fall 2022
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.
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

NUC ENG 107 Introduction to Imaging 3 Units

Terms offered: Spring 2024, Fall 2022, Fall 2020
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.
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

NUC ENG 120 Nuclear Materials 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.

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

NUC ENG 124 Radioactive Waste Management 3 Units

Terms offered: Fall 2024, Fall 2022, Spring 2021
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.

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

NUC ENG 130 Analytical Methods for Non-proliferation 3 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
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.

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

NUC ENG C146 Radiochemical Methods in Nuclear Technology and Forensics 3 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
Experimental illustrations of the interrelation between chemical and nuclear science and technology and nuclear forensics; radioactive decay and counting techniques; nuclear spectroscopy; fundamental radiochemical techniques; radiochemical separations techniques; tracers; activation analysis; forensic applications of radiochemistry; fusion, fission and nuclear reactors.

Objectives & Outcomes

Course Objectives: Familiarize students with principles of nuclear and radiochemistry and its many important applications in our daily lives; provide hands-on training.

Student Learning Outcomes: A solid understanding of nuclear and radiochemistry; proficiency in safe handling of radioactive materials in the laboratory, and appreciation for the wide application of radiochemical techniques in chemistry, nuclear technology, and nuclear forensics.

Rules & Requirements

Prerequisites: CHEM 4B or CHEM 15; and CHEM 143 is recommended

Credit Restrictions: Students will receive no credit for CHEM 146 after completing CHEM 144, or CHEM C144.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture and 4.5 hours of laboratory per week

Additional Details

Subject/Course Level: Nuclear Engineering/Undergraduate

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

Formerly known as: Chemistry 146

Also listed as: CHEM C146

NUC ENG 150 Introduction to Nuclear Reactor Theory 4 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023
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.

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

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

Terms offered: Spring 2025, Spring 2022, Spring 2021
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.

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

NUC ENG 156 Nuclear Criticality Safety 3 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.
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

NUC ENG 161 Nuclear Power Engineering 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.
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

NUC ENG 162 Radiation Biophysics and Dosimetry 3 Units

Terms offered: Fall 2025, Spring 2024, Spring 2023
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.
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

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

Terms offered: Fall 2025, Fall 2023, Fall 2021
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.

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 2025, Spring 2024, Spring 2023
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.

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

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.

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

NUC ENG 175 Methods of Risk Analysis 3 Units

Terms offered: Fall 2024, Fall 2022, Fall 2020
Methodological approaches for the quantification of technological risk and risk based decision making. Probabilistic safety assessment, human health risks, environmental and ecological risk analysis.
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

NUC ENG 180 Introduction to Controlled Fusion 3 Units

Terms offered: Fall 2025, Spring 2025, Fall 2023
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.
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

NUC ENG H194 Honors Undergraduate Research 1 - 4 Units

Terms offered: Fall 2025, Fall 2024, Fall 2023
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.
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.

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

Terms offered: Fall 2025, Spring 2025, Fall 2024
Group studies of selected topics.
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.

NUC ENG 199 Supervised Independent Study 1 - 4 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
Supervised independent study. Enrollment restrictions apply; see the Introduction to Courses and Curricula section of this catalog.

Rules & Requirements

Prerequisites: Consent of instructor and major adviser

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.

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.

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.