

Chemical Engineering 412 — Introductory Nuclear Engineering, Winter 2026

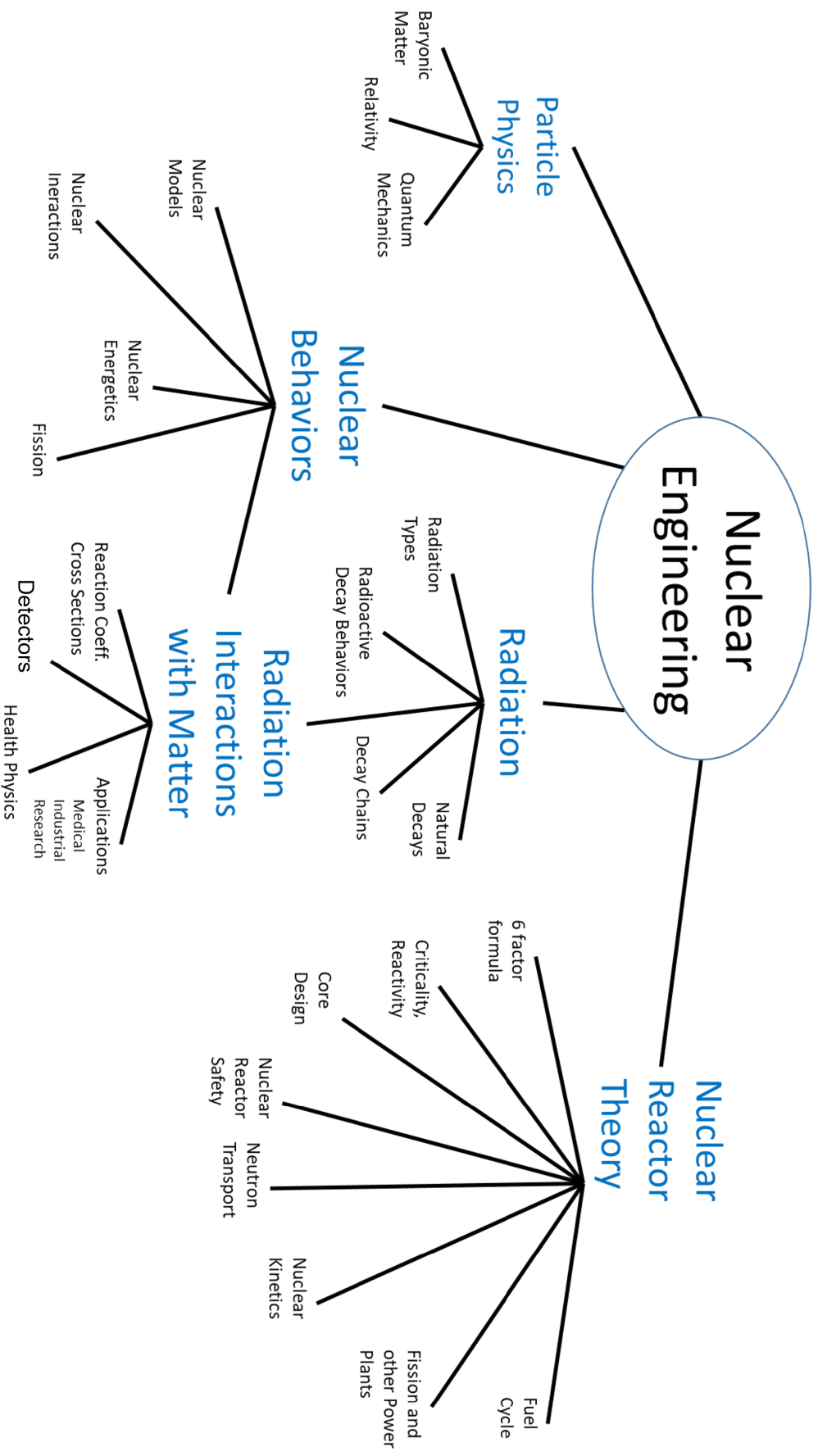
- Location:** 245 CB
Time: 12:30-1:45 PM - T, Th
Prerequisites: Math 303, Chem 105/111, ChE 376 or equivalent (recommended)
- Instructor:** Matthew J Memmott
330K Engineering Building; (801) 422-6237
memmott@byu.edu; <http://www.et.byu.edu/~mjm82/che412/che412.html>
- Office Hours:** M-F 3:00 PM-4:00 PM, or by appointment.
- TA:** Douglas Stone: stone317@byu.edu
- TA Hours:** M,W 3:30 PM to 5:00 PM and Th 11:00 AM to 12:00 PM
- Course Objectives:** This is an introductory, multidisciplinary nuclear engineering course. We will cover a range of topics pertinent to nuclear engineering, including particle physics, neutron theory, nuclear reactor design, medical applications, societal impacts of nuclear power.
- Textbook:** Fundamentals of Nuclear Science and Engineering, 3rd edition, J. Kenneth Shultz and Richard E. Faw, CRC Press 2016.
- Reading:** Lectures are designed to help students learn the course content, but many details and examples are given in the text. Reading prior to discussion will facilitate greater understanding in lectures.
- Homework:** Homework assignments will be due almost every class period. Homework is designed to help you learn the course material through direct application. You are encouraged to work in groups, but you must turn in *your own* assignment, representing *your own* work. Late homework will be accepted up to the corresponding exam period for 50% credit. Homework solutions will be kept by the TA or the Department secretaries. You are on your honor not to use posted solutions in the working of late homework.
- Exams:** Three midterm exams will be administered. The exams will either be held in the regular lecture room or as a take-home exam, unless otherwise stated. If you are unable to attend an exam you must notify me before the exam.
- Final Exam:** The final exam will cover all the material covered in the class, and will be divided into two parts. This will include an online closed-book portion, and an in-class open-book portion. The online portion (closed-book) must be completed before the end of finals, while the closed book portion will be held in the classroom on Wednesday April 22, from 11:00 AM to 2:00 PM.
- Course Details:** Class time will primarily cover the most important topics discussed in the corresponding sections of the reading. This will include interactive discussions and working problems similar to the homework out in class. This course covers significant new material, and there is far more material than can be covered in class. Thus the most important nuclear concepts will be covered in class, while the remainder is left for individual exploration from the additional readings and textbook. Further, in this course there is an emphasis on *conceptual* understanding. This generally involves (1) understanding relationships between what students know and what is new, (2) applying concepts in abstract and in practice to solve problems, and (3) combining differing concepts to form solutions and designs. Whenever possible, classes may include field trips, projects, or participation in other non-classroom settings to try to help students appreciate what they are learning from many perspectives.
- Graduate Course:** Graduate students taking this course will be required to read and review three (3) papers related to nuclear technology as part of this course. These papers will be provided by the instructor, and each paper will be due the day of each exam, respectively.

Participation: Each student is expected to attend each class period and participate in the class. In-class sessions will provide opportunities for discussions. Unannounced quizzes will periodically help encourage this attendance. Please contact the instructor and/or TA if you must miss class. We will make reasonable accommodation for legitimate absences (your child being born, attending immediate family funeral, contagiously ill) but will be less sympathetic to less legitimate absences (dog eats homework, etc.). Each student is expected to engage in classroom and homework discussions. Your grade will depend in large extent on your active participation in solving the assigned problems and discussing their eventual solution.

Grading: Grades for the course will be based on the following distribution:

Homework	30%
Quizzes	10%
Final Exam	30%
Midterm Exams (3)	30%

Chemical Engineering 412 Competencies			
Comp.	Level	Usage	Outcome
1.3	1	P	Students will gain familiarity with the chemical engineering field, career options, and potential job functions, and awareness of contemporary issues that may have an impact on professional activities.
1.4	1	M	Students will develop an appreciation and respect for other disciplines and a knowledge of how chemical engineering relates to other disciplines
2.1	2	P	Students will gain a knowledge of linear algebra, multivariable calculus, and ordinary differential equations.
3.1.1	3	P	Be able to use basic engineering units in both SI and AES systems in solving problems, and be able to interconvert between unit systems
4.9	1	P	Students will demonstrate effective interpretation of graphical data .
6.1	3	P	Students will demonstrate an ability to solve engineering problems .
6.4	2	P	Students will exhibit critical and creative thinking skills for analysis and evaluation of problems and cause-effect relationships.
6.6	2	P	Students will be able to rationalize units , make order of magnitude estimates , assess reasonableness of solutions, and select appropriate levels of solution sophistication .
7.2	2	P	Students will understand and have a basic knowledge of how safety considerations are incorporated into engineering problem solving.
7.4	2	P	Students will understand and have a basic knowledge of how environmental considerations are incorporated into engineering problem solving.
12.8	1	P	Students will demonstrate effective reading of technical material .
Levels	1- exposure to material, but may not be assessed		
	2- competency assessed in course		
	3- competency is assessed in course at again before graduation		
Usage	M=main course content; P=developed throughout the program; I=Introduction		



BYU Policy Statements

Academic Honesty

The first injunction of the BYU Honor Code is the call to be honest. Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life's work, but also to build character. President David O. McKay taught that "character is the highest aim of education" (The Aims of a BYU Education, p. 6). It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

Honor Code Standards

In keeping with the principles of the BYU Honor Code, students are expected to be honest in all of their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university. Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and my own expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

Preventing Sexual Harassment

Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds. The act is intended to eliminate sex discrimination in education. Title IX covers discrimination in programs, admissions, activities, and student-to-student sexual harassment. BYU's policy against sexual harassment extends not only to employees of the university, but to students as well. If you encounter unlawful sexual harassment or gender-based discrimination, please talk to your professor; contact the Equal Employment Office at 422-5895 or 367-5689 (24-hours); or contact the Honor Code Office at 422-2847.

Students with Disabilities

Brigham Young University is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability which may impair your ability to complete this course successfully, please contact the Services for Students with Disabilities Office (422-2767). Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. Services are coordinated with the student and instructor by the SSD Office. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D-285 ASB.