

### Reference Books

- Rice, Do, and Maneval, “*Applied Mathematics and Modeling for Chemical Engineers*”, 3rd Ed., Wiley, 2023.
- Press *et al.*, “*Numerical Recipes: The Art of Scientific Computing*”. <https://numerical.recipes/>

### Homework

Ungraded homework problems will be assigned to help reinforce the materials covered in class. While these exercises will not be collected or graded, completing them is strongly recommended, as they closely mirror the problems that will appear on the exams.

### Project

There will be one project on “Selected Topics in Mathematical Modeling”. Example topics may include introducing a new analytical or numerical method or applying one already covered in class. Each student must consult with the instructor to determine an appropriate topic and project scope prior to beginning work. Students will present their projects to the class and respond to questions from both the instructor and their peers. Presentations should be well-organized, make effective use of the whiteboard and/or projector, and should not exceed 20 minutes. The project presentation will be graded by the audience on a scale from 1 to 10 (1 being the lowest and 10 the highest).

### Examinations

This course includes three midterm exams and one cumulative final exam. All exams are closed book; however, a formula cheatsheet will be provided. No makeup exams will be offered, and students who miss an exam will receive a score of zero unless the absence is excused. Requests for an excused absence must be submitted in writing to the instructor by the end of the day following the exam. Requests for regrading must be submitted in writing prior to the final exam and must include a clear and justifiable rationale.

### Grades

The final numerical grade ( $g$ ) will be determined by the following components: the project (15%), three midterm exams (20% each), and the final exam (25%). The final letter grade will be assigned based on the class average ( $A$ ) and standard deviation ( $\sigma$ ) calculated from  $g$ . Grade boundaries are somewhat flexible, allowing numerical grades that are close in value to correspond to the same letter grade.

### Office Hours

Offered weekly online via Teams by the instructor during a time selected by the class. You can also set up an appointment outside this time with the instructor (970-491-2763 or [qwang@colostate.edu](mailto:qwang@colostate.edu)).

### Prerequisites

A course on differential equations at the undergraduate level (*e.g.*, [MATH 340, 345, or 332 at CSU](#)) is needed for taking this course. There will be one quiz (closed book, no notes) on the prerequisites, which does not count towards the final grade for this course.

### **Academic Integrity Policy**

This course will adhere to the [Academic Integrity Policy](#) of the Colorado State University General Catalog and the [Student Conduct Code](#). The policy is zero tolerance. The *minimum* action taken for academic dishonesty will be a failing grade for the course. In particular:

- Students may not copy any part of an exam from other students, *including those in previous years*. The student who knowingly provides their exam to be copied is also in violation of the CSU policy.
- Discussing the content of an exam with someone who has not taken the exam is not allowed.

### **Use of AI Tools**

Students are permitted—and encouraged—to use AI tools to support their learning in this course. However, such use must adhere to the following principles:

1. **Skepticism:** Treat all AI-generated responses as potentially *incorrect* until you have independently verified them through other reliable sources or methods.
2. **Enhancement of Learning:** AI should be used to deepen your understanding, not to complete assignments on your behalf. For example, using AI to help debug code you have written is appropriate; asking AI to write code or solutions you are responsible for is not.
3. **Transparency and Ethical Use:** As students and future professionals, you are ultimately accountable for all submitted work, even if you use AI or supervise others in producing it. You must give proper credit for others' contributions and clearly acknowledge any work that is not entirely your own.

### **Catalogue Description**

Application of mathematical models to analysis and design of chemical reactors and separation processes.

### **Learning Objectives (can also be used as your study guide for exams)**

Upon successful completion of this course, students will be able to:

1. Apply mathematical modeling and error analysis in practical chemical engineering problems.
2. Select and implement appropriate analytical and numerical methods in linear algebra.
3. Solve nonlinear equations efficiently.
4. Explain key concepts and theorems in vector calculus.
5. Select and apply suitable analytical and numerical methods to solve ordinary and partial differential equations.
6. Utilize functional calculus for optimization.

***Preliminary Class Schedule for Fall 2025***  
***11:15am-12:30pm MW in 357 Scott***

<b>Week</b>	<b>Date</b>	<b>Topic</b>
1	Aug. 26 Aug. 28	Introduction <b>Quiz (in class)</b> , Modeling and Error Analysis
2	Sep. 2 Sep. 3	Linear Algebra
3	Sep. 8 Sep. 10	
4	Sep. 15 Sep. 17	Solving Nonlinear Equations
5	Sep. 22 Sep. 24	<b>Mid-term Exam 1 (in class)</b>
6	Sep. 29 Oct. 1	Vector Calculus
7	Oct. 6 Oct. 8	Ordinary Differential Equations
8	Oct. 13 Oct. 15	<b>Mid-term Exam 2 (in class)</b>
9	Oct. 20 Oct. 22	
10	Oct. 27 Oct. 29	Partial Differential Equations
11	Nov. 3 Nov. 5	<b>Mid-term Exam 3 (in class)</b>
12	Nov. 10 Nov. 12	
13	Nov. 17 Nov. 19	
14	Nov. 24 Nov. 26	<b><i>No Classes and Office Hours This Week – Fall Recess</i></b>
15	Dec. 1 Dec. 3	Functional Calculus
16	Dec. 8 Dec. 10	<b>Project Presentations</b>
	Dec. 17	<b>Final Exam (6:20~8:20pm in classroom)</b>

**Note:** *This schedule may be modified during the semester.*