



CHME 516 – Numerical Methods in Chemical Engineering
Fall Semester 2023

Class Schedule: Monday, Wednesday 10:30 a.m.-11:45 am. Jett Hall room 177 (computer lab) or online via Zoom

No class Sept. 4 (Labor Day), Oct. 9 (Indigenous Peoples Day), Nov. 20 and 22 (Thanksgiving Holiday)

Catalog Description:

CHME 516. Numerical Methods in Chemical Engineering (3 credit hours)

Survey of numerical methods for solving problems commonly encountered in heat and mass transfer, fluid mechanics, and chemical reaction engineering.

Required Textbook:

Al-Malah, Kamal I. M., *Matlab Numerical Methods with Chemical Engineering Applications*, McGraw-Hill, 2014, ISBN# 978-0-07-183128-4. Please note that you can use hard-copy (printed), electronic (kindle), or electronic (brytewave) formats of this textbook.

Audience: This class is intended for chemical engineering students. It is one of the core courses.

Instructor: Dr. Tom Manz
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Teaching Assistant: Reza Ghanavati, Office: Jett Hall 152, Email: rgh@nmsu.edu

Instructor & TA Office hours: 2-3 PM on Tuesdays (Reza in-person JH 152, Tom via zoom) and 11am-noon on Thursdays (Reza via zoom, Tom in-person JH 150)

Midterm Exam: none

Final Exam: 2 hours, comprehensive, Monday, Dec 4, 10:30 am – 12:30 PM JH room 177 (computer lab) or via zoom.

Course Objectives:

A working knowledge of numerical methods and basic programming skills is critical for solving many classes of problems that occur in both academic and industrial settings. This class will provide the students with basic computational skills for solving many classes of engineering problems. It will also help the students gain a working knowledge of Matlab programming.

At the end of this course you will be able to:

- Understand criteria to evaluate and compare the performance of different numeric methods
- Solve linear and nonlinear systems of equations for several unknown variables
- Numerically solve ordinary and partial differential equations to solve both initial and boundary value problems
- Numerically optimize functions to find zeros, minima, and maxima.
- Use and understand the key differences between different numerical methods
- Solve basic problems in statistics and data regression for model parameter estimation
- Prepare Matlab programs using user-defined functions and scripting files
- Use Matlab to manipulate data plots
- Use Matlab to perform both symbolic and numeric integration of mathematical functions
- Apply these numerical methods to the solution of Chemical Engineering problems, including batch reaction kinetics, heat transfer, mass transfer, and vapor-liquid equilibria calculations.
- Understand and use Matlab control structures, including iterative loops and “ IF ... THEN” blocks.

Grading:

Homework will be based on the problems at the end of each chapter. The final examination will be two hours in length and will be **comprehensive**.

Homework will be coordinated with lectures and will be due approximately one week after assignment. Late homework may be submitted for grading before the solution is posted. Homework cannot be turned in late after the solution is posted or given in class. Homework can be turned in early if a student expects to be absent.

The total point accumulation and final grade distribution for this course will be as follows:

Homework: 50 %, Quizzes: 20%, Writings: 10%, Final: 20 % (in class, comprehensive)

Online resource: Course related content will be posted on **canvas**, which is accessed via **nmsu.instructure.com**.

Grading Scale:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
below 60%	F

Online resource: Course related content will be posted on **canvas**, which is accessed via **nmsu.instructure.com**.

Withdrawals: Students **will not** receive an automatic drop for persistent absences or persistent failure to complete assignments. The responsibility for withdrawals is completely up to the student.

Working together on assignments: Teamwork on homework is encouraged for learning purposes. However, all assignments turned in by the student must show the **student's own work and not be duplicates**. All examination answers must be **strictly one's own work**. Copying homework or allowing others to copy your homework is strictly forbidden and both parties will receive a zero for the assignment. See the Common Syllabus Addendum for more details.

Incomplete Grades: A grade of Incomplete (I) is given **only if the student is passing** and cannot complete the required work for reasons beyond the student's control that develop after the last day to withdraw from the course.

Accessing the zoom meetings:

For lectures (Monday and Wednesdays, 3:20 p.m. – 4:20 p.m.) and office hours (Tuesdays 2 – 3 pm and Thursdays 11 am – noon) links to the zoom meetings will be posted in Canvas. The passcode is Zoom#123 Please attend the lectures in-person if you are able. If you cannot attend in-person, you should attend synchronously (at the same time) via zoom, or as a last resort asynchronously (later) by watching the recorded zoom meeting. Please attend in person or synchronously unless you have a time conflict. The lectures will be recorded for subsequent viewing in case you need to review content or had an attendance conflict and need to view online.

Common Syllabus Addendum: https://provost.nmsu.edu/faculty-and-staff-resources/syllabus/FA23_SyllabusAddendum_2023.03.211.pdf