

Chemical Engineering 361

Mathematical Modeling

Spring 2014

COURSE DESCRIPTION: Development and analysis of mathematical models for chemical engineering systems. Topics include linear algebraic systems, ordinary differential equation models, numerical methods for model solution, and statistics for data analysis and experimental design.

COURSE OBJECTIVES: Upon completion of this course, students should:

1. Understand the importance of mathematical modeling and analysis in Chemical Engineering.
2. Be able to formulate mathematical models of complex chemical engineering systems and apply them to the analysis of experimental data.
3. Be able to solve linear models analytically and to use numerical methods for computer solution of nonlinear models.
4. Be able to analyze the behavior of dynamic models using a combination of analytical and computer-based techniques.
5. Be able to perform statistical analysis of experimental data and to develop statistically-based experimental designs.
6. Develop good engineering practices for composing and solving problems, particularly open-ended problems requiring computer solutions.
7. Be prepared to use the principles and tools learned in this class to solve problems not covered in detail as part of this course and to continue learning related materials as needed in the future.

These objectives are intended to address the ABET outcomes of (a) Technical Knowledge, (c) Design, (e) Problem-Solving, (g) Communication, (h) Global/Societal Impact, (i) Life-Long Learning, (j) Contemporary Issues and (k) Applications.

PREREQUISITES: MATH 331 and ChE 320

COREQUISITES: ChE 333 and ChE 338

CLASS TIMES: Tuesdays and Thursdays, 8:00-9:15 am, Goessmann Room 20; Wednesdays, 8:00-8:50 am, Goessmann Room 20 (as scheduled)

INSTRUCTORS: Prof. Michael A. Henson, N527 Life Science Laboratory, henson@ecs.umass.edu

TEACHING ASSISTANTS: Jin Chen, N587 Life Science Laboratory, jinchen@ecs.umass.edu; Shengkai Li, Conte A232, shengkaili@ecs.umass.edu; Jared Post, jpost@umass.edu

REQUIRED TEXT: E. Kreyzig, *Advanced Engineering Mathematics*, J. Wiley and Sons, 10th edition (2011). Electronic version available for sale:
<http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP001850.html>

GRADING: Homeworks – 10%
Project – 10%
Midterm exams – 45%
Final exam – 35%

EXAMS: All exams will be open book. The only materials allowed to be used during exams are the textbook, lecture notes and your completed homework assignments.

HOMEWORKS: Homeworks will be assigned weekly throughout the semester. Written homeworks will not be collected and graded, but students will need to complete these short assignments to be successful on the exams. Matlab homeworks will be assigned every few weeks and must be submitted for grading. These homeworks can be completed and submitted by two-member groups. All assignments are due at the beginning of class one week after they are assigned. No late homeworks will be accepted. Solutions must be presented in a neat and clear manner. Each student will need to obtain a student license for Matlab/Simulink (\$99) and the associated toolboxes that are provided at no additional charge. Details on the student license are provided here: www.mathworks.com/academia.

PROJECTS: A Matlab project will be due the last day of class. These projects must be conceived and completed by four-member groups. Each group will be required to propose an original topic approximately two-thirds through the semester for approval by the instructor.

COURSE MATERIALS: Homework assignments and other selected course materials will be posted on the course webpage. The URL for the webpage is www.ecs.umass.edu/che/che361.

ATTENDANCE: You are expected to attend all required classes. The Student Handbook, Section VIII, outlines the procedures for dismissal from the course for non-attendance. Attendance in the lectures is very important. The lectures are used to present new information and provide background for the assignments. You are responsible for all of the material presented in lectures.

ACADEMIC HONESTY: Academic honesty is extremely important. You must be sure to do your own work and protect your work from plagiarism by others. Delete your files from the work space on the computer when you are leaving. If there is any evidence that the Academic Honesty Policy has been violated, you may be subject to severe penalties, ranging from receiving a grade of F for the course to dismissal from the University.