Chemical Engineering 231
Mathematical Modeling
Spring 2019

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

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 perform statistical analysis of experimental data and to use computer-based tools for data analysis.

3. Be able to formulate algebraic and ordinary differential models of chemical engineering systems.

4. Be able to solve linear models analytically and to use numerical methods for computer solution of nonlinear models.

5. Develop good engineering practices for composing and solving problems, particularly open-ended problems requiring computer solutions.

6. 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: ChE 120

COREQUISITES: Math 331 and ChE 226

REQUIRED TEXT: E. Kreyzig, *Advanced Engineering Mathematics*, J. Wiley and Sons, 10th edition (2011). An electronic version is available for sale at `www.wiley.com`.

SOFTWARE: Each student will need to obtain a student license for Matlab ($99) and the associated toolboxes that are provided at no additional charge. Details on the student

license are provided here `www.mathworks.com/academia`. A temporary free Matlab license can be obtained through UMass at `www.umass.edu/it/software#science`.

CLASS TIMES: Tuesdays and Thursdays, 1:00-2:15 pm, Goessmann Room 20; Wednesdays, 12:20-1:10 pm, Goessmann Room 20

INSTRUCTORS: Prof. Michael A. Henson, N267 Life Science Laboratory, mhenson@umass.edu

GRADUATE TEACHING ASSISTANTS: Natthapong (Feem) Sueviriyapan, nsueviriyapa@umass.edu, LSL N587; Ayushi Patel, ayushipatel@umass.edu, LSL N587

UNDERGRADUATE GRADERS: Eric Blanchard, eablanchard@umass.edu; William McInerney, wmcinerney@umass.edu; Jun-Goo Kwak, jungookwak@umass.edu; Deanna Lobo, dlobo@umass.edu;

GRADING: In-class exercises – 10%
           Written homeworks – 10%
           MATLAB homeworks – 10%
           Project – 10%
           Midterm exams – 35%
           Final exam – 25%

IN-CLASS EXERCISES: Most lectures will include a short exercise designed to test your basic understanding of the material. Multiple choice answers will be submitted with i-clickers. Therefore, each student must register their i-clicker with the class through Moodle. Exercises will be assessed with respect to the both participation and correctness.

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: Written homeworks will be assigned approximately weekly throughout the semester. Three Matlab homeworks also will be assigned during the semester. Matlab homeworks can be completed and submitted by two-member groups. All assignments must be submitted through Moodle. No late homeworks will be accepted. Solutions must be presented in a neat and clear manner.

PROJECTS: A Matlab project will be due the last day of class. Projects must be completed by four-member groups. The instructor will provide three project topics for selection approximately two-thirds through the semester.

COURSE MATERIALS: All course materials will be placed on Moodle. These materials include lecture slides, recorded lecture videos, homework assignments and solutions, old exams and solutions, and Matlab codes.

SPECIAL ACCOMMODATIONS: If you need course accommodations because of a disability,

please contact Disability Services at 413-545-0892 as soon as possible to ensure that such accommodations are implemented in a timely fashion. All exams must be arranged through Disability Services.

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.

INCLUSIVITY: The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing, speak with Assistant Dean Paula Rees (rees@umass.edu, 413.545.6324, Marston 128), or submit your concern through the College or Engineering Climate Concerns and Suggestions on-line form (tinyurl.com/UMassEngineerClimate). We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect.