

Chemical Engineering 3E4, Fall 2010

Process Model Formulation and Solution

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Class time and location Room 125 in building T13 (between the McMaster hospital and the new engineering building). Every Monday, Wednesday, and Thursday, from 17:30 to 18:30.

Lab/tutorial time and location Will be confirmed in class.

1 About the course

Official description Formulation of models for various chemical processing units in both steady and unsteady states. Techniques for numerical solution of model equations, including algebraic and ordinary differential equations, both linear and non-linear.

Objectives Given a verbal statement of a problem involving a specific chemical processes, this course will provide the student with the ability to: (i) formulate a mathematical model in terms of algebraic or differential equations; (ii) propose an appropriate numerical method; and (iii) find a solution using calculator and software tools.

Prerequisites Minimum grade of D- in **CHE 2F04**, taken **Math 2M06**, or permission of the Department.

Course materials All course materials will be available from the course website: <http://modelling3e4.connectmv.com>

All course announcements, assignments and solutions will be posted on the website. Course hand outs will be made available on the site prior to the next class. It is your responsibility to print out the class notes and bring them to the class.

Required textbook The book by S. C. Chapra and R. P. Canale, *Numerical Methods for Engineers*, McGraw Hill, 5th or 6th Edition (5th edition on reserve in Thode).

5th edition ISBN = 0073101567 and 6th edition ISBN = 0073401064.

Feel free to buy either the 5th or 6th edition - there is no particular benefit to owning the newer edition. Generally the book is cheaper on Amazon.ca than the McMaster bookstore. And [second-hand copies of the book](#) are much cheaper. Also see this [list of second-hand sellers](#).

Recommended readings Other readings to supplement the main text book:

- Hangos and Cameron, *Process Modeling and Model Analysis*, Academic Press, 2001.
- Recktenwald, *Numerical Methods with MATLAB - Implementation and Application*, Prentice Hall, 2000 (available on reserve).
- Etter, *Engineering Problem Solving with MATLAB*, Prentice Hall, 1993 (available on reserve).

Also see the other [suggested reading list](#) to supplement the above texts.

Course outline The course is divided into 6 main sections, taught over 12 weeks, 3 classes per week.

1. Modeling and scientific computing
2. Linear algebraic equations
3. Nonlinear algebraic equations
4. Curve fitting
5. Numerical differentiation and integration
6. Ordinary differential equations

Additional enrichment topics will be covered throughout the course.

2 Grading

To assess your understanding of the course materials, the grading for the course is broken down as:

Component	Fraction	Notes
Tutorials	10%	Expect around 10 tutorial sessions: must be handed in on the day of the tutorial
Assignments	20%	Expect 6 assignments; can be completed individually, or in groups of 4 or less
Midterm	10%	Take-home portion
Midterm	15%	A written test, lasting 2 to 3 hours
Final exam	45%	A written exam, lasting 3 hours

Policies regarding grading

- Grading of assignments and tests will include contributions for clarity and organization of presentation.
- No make-ups will be given for tutorials or assignments.
- No make-ups will be given for tests. If due to some legitimate reason (in case of medical issues, please provide a medical certificate) the student cannot participate in a test **and** provides a missed-work form, the contribution of that test to his/her overall grade will be added to the final examination weighting; for unexcused absences, a zero grade will be given.
- Attendance at tutorials is *not required*, but you must submit your tutorial question(s) at the tutorial, in written/printed form to receive the grade. The TA's will not accept electronic submissions, since their marking is done on paper copies.
- All assignments will be graded, and the best 5 of the 6 assignments used to calculate the assignment grade.
- This is a large class of over 90 students, so late hand-ins interfere with the TA's ability to efficiently grade your assignments. Late assignments will be penalized by 20% (one day) and 40% (two days). Solutions will be posted to the course site within in 2 days, so no further late submissions can be accepted.
- Emergencies and such arise, so each person has 2 late day credits for the assignments.
- Any textbook(s) and course notes will be allowed during tests and exams.
- Any calculator may be used during the tests and exams.
- The final percentage grades will be converted to letter grades using the Registrar's recommended procedure.
- Adjustment to the final grades may be done at the discretion of the instructor.
- We encourage you to complete the assignments in groups of no more than 4 participants.
- You, and your group, will receive the greatest benefit if you each do **all** the questions yourselves. Arrange to meet and review your solutions, discussing various approaches. Assemble a single submission for the group.
- You are defeating the purpose of the group-based assignment if you simply divide the assignment into sections, one for each group member. This is definitely not recommended, because you are losing out on the learning opportunity of seeing your mistakes and the group members' mistakes, and learning from them.
- No sharing of work may be done between groups - this will be strictly enforced. Please ensure that you have read the University's academic integrity policy (reproduced below).
- There is a heavy focus on group work (40% of the course grade). Please use this opportunity to your advantage to learn from, and with each other.
- All group submissions must clearly show the names of the group participants. You must hand in one assignment for the group. The TAs will not grade loose sheets handed in after the first submission, and there will be a corresponding reduction in marks.
- The take-home test will examine course content that requires a computer to complete the questions. The engineering labs have the course software installed, in the event that you do not have access to a computer.

3 Important notes

Class participation Please bring a calculator to every class and every tutorial.

Course software Use of a computer is required for the course. Both the MATLAB and Python programming language will be used, however you can use any suitable software to solve the course assignments, tutorials and tests. More details are posted on the course website.

Out-of-class access Since the course instructor does not have an office on campus, office hours will be during the lab time slots, or arranged by appointment.

The two excellent TA's for this course can be contacted by email - please see their addresses above. Please, only send email from your McMaster email address - we cannot respond to personal email addresses.

Disclaimer The above outline may be modified slightly, as circumstances change, with agreement from the class.

4 Academic integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at <http://www.mcmaster.ca/academicintegrity>

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.