



Course Syllabus
CM 3450 Computer Aided Problem Solving
College of Engineering
Fall 2010

Instructor Information

Instructors: Dr. Tom Co (CSB 202G) and Dr. Tony Rogers (CSB 305C)
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Course Identification

Course Number: CM 3450-L01
Course Name: Computer Aided Problem Solving
Course Location: ME-EM 120
Class Times: MTW 1:05pm – 2:55pm
Prerequisites: *MA 2160 Calculus with Technology II* - mastery of derivatives
and integration
CM 2110 Fundamentals of Chemical Engineering I – mastery of mass
balance concept

Course Description/Overview

The use of modern software packages in chemical engineering. Packages include spreadsheet, symbolic manipulator, chemical process calculator, statistical and modeling software. Course develops knowledge and skills in using computer tools that will complement chemical engineering courses and practice.

Course Learning Objectives

- Mastery of basic problem setup for computer solutions.
- Familiarity with advanced techniques of Excel and Mathcad.
- Familiarity with solution of multiple and/or nonlinear equations.
- Familiarity with using computer tools for optimization problems.
- Familiarity with using computer methods for solving differential equations.
- Familiarity with the use of process simulators, e.g. Unisim, for design of chemical manufacturing processes.

Course Resources

Course Website(s)

- <<http://www.chem.mtu.edu/~tbco/cm3450/cm3450-2010.html>>

Required Course Text

- H. Adidharma and V. Temyanko, *MathCad for Chemical Engineers*, 2nd Edition. Trafford Publishing, BC, Canada, 2009.
- UniSim R390 online documentation

Grading Scheme

Grading System

Letter Grade	Percentage	Grade points/credit	Rating
A	95% & above	4.00	Excellent
AB	90% – 94.99%	3.50	Very good
B	85% – 89.99%	3.00	Good
BC	80% – 84.99%	2.50	Above average
C	75% – 79.99%	2.00	Average
CD	70% – 74.99%	1.50	Below average
D	60% - 69.99%	1.00	Inferior
F	59.99% & below	0.00	Failure
I	Incomplete; given only when a student is unable to complete a segment of the course because of circumstances beyond the student's control. A grade of incomplete may be given only when approved in writing by the department chair or school dean.		
X	Conditional, with no grade points per credit; given only when the student is at fault in failing to complete a minor segment of a course, but in the judgment of the instructor does not need to repeat the course. It must be made up within the next semester in residence or the grade becomes a failure (F). A (X) grade is computed into the grade point average as a (F) grade.		

Grading Policy

Grades will be based on the following:

Part 1 and 2: Excel and MathCad - Assignments: 640 points - Drills: 160 points	800
Part 3: UniSim Assignments	400
Total Points	1200

Late Assignments and Projects

Late submissions will be deducted 10 points each per day. Submissions that are one week late or more will not be accepted.

Course Policies

1. For part 1 and 2, Excel and Mathcad, attendance is required for the Monday and Wednesday classes. The Tuesday class will be problem solving/consultation sessions only. However, for part 3, UniSim, attendance is required for Monday, Tuesday and Wednesday. Letters need to be submitted formally and officially to request for excused absences, and it should include: date, reason, documentation and plan for makeup. Valid reasons include: sickness, job interviews, athletic, university or military obligations.
2. Assignments need to be done individually. Discussions are allowed but the work can not be copied (revising another student's document is not allowed).
3. Late submissions of assignments will be deducted 10 points a day. Submissions that are one week late or more will not be accepted.
4. Weekly assignments should be submitted as a one-page memo report (hardcopy) together with attachments of the programs. A separate email copy should also be submitted to the instructor for archival purposes.

Collaboration/Plagiarism Rules

All work needs to be done individually. File exchanges involving required drills, assignments and projects between students are not allowed, and will be considered as violation of the Academic Integrity Code of Michigan Tech.

University Policies

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance with the University's policies.

If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, at 487-2212. For other concerns about discrimination, you may contact your advisor, department head or the Affirmative Action Office, at 487-3310

Academic

Integrity:http://www.studentaffairs.mtu.edu/dean/judicial/policies/academic_integrity.html

Affirmative Action:

<http://www.admin.mtu.edu/aao/>

Disability

Services:http://www.admin.mtu.edu/urel/studenthandbook/student_services.html#disability

Equal Opportunity Statement:

<http://www.admin.mtu.edu/admin/boc/policy/ch3/ch3p7.htm>

Course Schedule

Week 1

Microsoft Excel (T. Co)

- Equation editing using keystrokes in MS Word 2007
- Data tables
- Arrays and array functions

Week 2

- Solution of simultaneous linear equations

Week 3

- Linear regression
- SOLVER – solution of nonlinear equations
- SOLVER – optimization and nonlinear regression

Week 4

- VBA programming – functions and macros

Week 5

MathCad (T. Co)

- Basics 1: equations, text, units and functions
- Basics 2: Plotting, data export/import

Week 6

- Symbolic Manipulations
 - User-interactive mode
 - “Live” mode

Week 7

- Solution of Nonlinear equations
 - Using “roots” functions and “Find” blocks
 - Parameterization

Week 8

- Curve fitting via splines
- Curve fitting via nonlinear regression
- Differentiation and Integration

Week 9

- Unconstrained optimization
- Constrained optimization

Week 10

- Ordinary differential equation
- Partial differential equation

Week 11

UniSim (T. Rogers)

1. Basics of UniSim
 - a) Setting global simulation 'Preferences'
 - b) Configuring the 'Basis Environment'
 - i. Components
 - ii. Thermodynamics models
 - iii. Reaction sets
 - c) Building a process flowsheet (flash drum example)
 - d) Results & Reporting
 - e) Interfacing with Microsoft Excel

Week 12

2. UniSim 'Simulation Environment'
 - a) Recycle Block
 - b) Adjust Block
 - c) Unit Operations 'Palette'
 - d) Degrees of freedom for user inputs
 - e) Specifying subcooled, saturated, and superheated streams
 - f) Rankine steam power cycle example

-----(*Thanksgiving break*) 11/19 – 11/28

Week 13-14

3. More UniSim Examples & Tips
 - a) Reactors (CSTR, PFR, Equilibrium, Conversion)
 - b) Phase Separators (2-phase, 3-phase)
 - c) Mixers & Tees
 - d) Staged Separations (Distillation Columns, Absorbers, Strippers)