ChE 230 - Numerical Methods for Chemical Engineering
Spring 2011

Instructor: C.D. Stinespring
Office: 423 ESB
Phone: 304-293-9363
Email: charter.stinespring@mail.wvu.edu
Class: TR 3:30-5:20 PM / Room 401 ESB

Course Objectives:

1. Students will understand the basic algorithms for solution of and be able to solve non-linear algebraic equations.
2. Students will understand the basic algorithms for solution of and be able to solve linear algebraic equations.
3. Students will understand the basic algorithms for solution of and be able to solve optimization problems.
4. Students will be able to perform basic statistical analyses using the *z*, *t*, χ^2, and *f* tests.
5. Students will be able to perform single and multiple linear regressions.
6. Students will be proficient in manipulation of logarithmic, exponential, and other non-linear functions in order to linearize and to regress non-linear expressions.
7. Students will understand the basic algorithms for fitting curves to data and be able to fit curves to data.
8. Students will understand the basic algorithms for solution of and be able to solve numerical integration problems.
9. Students will understand the basic algorithms for solution of and be able to solve problems in ordinary differential equations.
10. Students will be proficient in the use of software such as Excel, Polymath, and Mathcad to solve the types of problems listed above.
11. Students will feel comfortable when encountering and solving the types of problems listed above.
12. Students will be able to perform material and energy balances on a process flow sheet and tear the flow sheet if necessary to solve a recycle problem.
13. Students will be able to apply the techniques learned in this class to the solution of a comprehensive design problem.
14. Students will increase their proficiency in oral and written communication.

Texts: Chapra, S. C. and R. P. Canale, *Numerical Methods for Engineers (4th ed.)*, WCB/McGraw-Hill, 1998.
Felder, R. M. and R. W. Rousseau, *Elementary Principles of Chemical Processes (3rd ed.)*, Wiley, 2000.

Grading:	Two Exams @ 20%	40%
	Final Exam	25%
	Problem Sets	15%
	Design Project	20%

Grades:	The nominal grading scale is	≥90%	A
		≥80%	B
		≥70%	C
		≥60%	D
		<60%	F

At the instructor's discretion, this scale may be lowered, but it will not be raised.

Course Policies (exceptions at discretion of instructor):

1. There are no make-up exams.
2. All problem sets are due at the beginning of class.
3. A late assignment = no assignment.
4. Exam grading appeals must be submitted in writing on the day the exam is returned. If you miss that class, you lose the opportunity for re-grading.
5. Any classes canceled due to inclement weather (or any other reason, such as fire alarms) will be rescheduled.
6. If the fire alarm goes off during an exam, the resolution of the situation is solely at the discretion of the instructor.
7. You may (and are encouraged to) work in groups on problem sets. However, what you submit must be your own work. Assignments that are obviously copied will receive no credit.
8. Problem sets and exams should be neat and easy to follow. Each problem should start on a new page. Your answer should be boxed, have units as appropriate, and have the correct number of significant figures. There will be a deduction for each answer that significantly exceeds the correct number of significant figures. Problems should be worked in the units provided. No credit will be given for problems not worked in the units provided. No credit will be given for answers without work. Credit will be deducted for missing or incorrect units, sloppy work that is hard to follow, and for the incorrect number of significant figures. You should round off the final answer to the correct number of significant figures. If you round off intermediate calculations, thereby making your final answer inaccurate, significant credit will be deducted.
9. If you do not participate in the design project as part of your assigned group, your grade for the entire course will automatically be an F, regardless of other grades earned in this class.
10. You must be in the audience for all of the sophomore design presentations. This means you must be in the classroom, not in the hall or in the computer room. Failure to do so will result in reduction by one full letter on your design project grade.
11. You must attend the senior design presentation at (time and date to be announced) unless you have other class obligations. If this is the case, please advise me in writing well in advance. Failure to do so will result in reduction by one full letter on your design project grade.

ChE 230 - *Approximate* Syllabus– Spring 2011

Class	Date	Topic	Reading	Assignment
1	11-Jan	Introduction, Error	1-4	PS 1
2	13-Jan	Roots of Non-linear Equations	5,6	
3	18-Jan	Roots of Non-linear Equations		PS 2
4	20-Jan	Roots of Non-linear Equations		
5	25-Jan	Systems of Linear Equations	9,11	PS 3
6	27-Jan	Systems of Linear Equations		
7	1-Feb	Systems of Linear Equations		
8	3-Feb	Flowsheeting		
9	8-Feb	Flowsheeting	13-15	
10	10-Feb	Optimization		PS 4
11	15-Feb	Optimization		
12	17-Feb	Statistics - Introduction		
13	22-Feb	**Exam 1**		
14	24-Feb	Normal Distribution, Confidence Intervals		PS 5
15	1-Mar	Small Samples, t-distribution		
16	3-Mar	Tests on Variances		PS 6
17	8-Mar	Statistics Review Problems		
18	10-Mar	Regression	17	PS 7
	15-Mar	Regression		
	17-Mar	Curve Fitting	18	PS 8
19	22-Mar	**SPRING BREAK**		
20	24-Mar			
21	29-Mar	**Exam 2**		
22	31-Mar	Numerical Integration	21	PS 9
23	5-Apr	Ordinary Differential Equations		
24	7-Apr	ODEs and Systems of ODEs	25	PS 10
25	12-Apr	ODEs and Systems of ODEs		
26	14-Apr	Finite Differences for ODEs and PDEs	23,27.1,29.1-29.2	
27	19-Apr	Finite Differences for ODEs and PDEs		
28	21-Apr	Finite Differences for ODEs and PDEs		
	25-Apr	Project presentations (During ChE 202 time slot)		
29	26-Apr	Project presentations		
	27-Apr	Project presentations if needed (During ChE 202 time slot)		
30	28-Apr	Project review		
31	6-May	**FINAL EXAM 8am-10am (1530 TR timeslot)**		