Computer Applications (ME 325), Fall 2015

Department of Mechanical Engineering, Wichita State University

Instructor:	Dr. Gisuk Hwang
Office location/hours:	EB 101C, M/W 11:00am – 12:30 pm or by appointment
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Class schedule	M/W 12:30-2:00 pm, HH211
Co-requisites:	MATH 243 (Calc II) or by instructor permission

Course Description: This course provides the basic numerical methods to understand, analyze, and design the various engineering systems. This includes linear systems of equations, least square problems, eigenvalue problems, and singular value problems, and ordinary differential equations. The students will learn not only basic principles of numerical analysis, but also practical applications to the various numerical problems through the commercially available computer software, e.g, MS EXCEL and MATLAB.

Objectives:

At the end of this class, the students should be able to do the followings:

a) To learn how to apply knowledge of mathematics, science, and engineering;

b) To know how to design a system, components or process to meet the desired goal;

c) To identify, formulate, and solve engineering problems;

d) To learn how to effectively communicate through assignments and projects;

e) To use techniques, skills and modern engineering tools necessary for engineering practice.

References:

- Numerical method: (Paperback) Elliott W. Cheney and David R. Kincaid, *Numerical Mathematics and Computing*, 7th Ed., Brooks Cole, 2012
- Excel tutorials: (Paperback) Mike Smart, *Learn Excel 2013 Essential Skills with The Smart Method: Courseware tutorial for self-instruction to beginner and intermediate level*, The Smart Method Ltd, 2013, (Online) http://chandoo.org/wp/excel-basics/, https://www.youtube.com/watch?v=8L1OVkw2ZQ8 (MS Excel 2010)
- Matlab tutorials: (Paperback) Peter I. Kattan, *Matlab for Beginners: A Gentle Approach*, Petra Books, 2008; (Online) http://www.math.ucsd.edu/~bdriver/21d-s99/matlab-primer.html; http://web2.clarkson.edu/class/ma571/Xeno-MATLAB_guide.pdf; http://www.cyclismo.org/tutorial/matlab/

Grading policy:

Homework (10-12 assignments)	20%
Quiz (10-12 sets)	20%
Midterm Exam	20%
Final Exam	20%
Final Project	20%

A: 100-95 (%), A-: 94-90, B+: 89-85, B: 84-80, B-: 79-75, C+: 74-70, C: 69-65, C-: 64-60, D+: 59-55, D: 54-50, D-: 49-45 F: < 45.

Reading assignments & homework/quiz:

Students are strongly encouraged to go through the reading assignments before the class. 10-12 homework sets are assigned, and homework due is by the same date in the following week unless specified. 10-12 short quizzes are given based on the homework problems.

Extra credit and make-up assignments:

No extra credit work will be assigned/accepted. Make-up exams will be administered only upon the submission of the relevant documents, explaining the reasons for the missing ones.

Project:

Students can work on the project by themselves. Students must meet the instructor at least three times during the semester, i.e., to review your project agenda, to review your project progresses, and to discuss the final presentation and report. These three meetings have three important deadlines reported in the course schedule (see schedule for the deadlines). Evaluation criteria are provided in BlackBoard.

Disciplinary Infractions and Ethical Behavior

The use of laptops is allowed during the lesson but only for work related to the course activities. Discussions related to the grade will take place ONLY in in-person meetings scheduled by appointment via e-mail or during office hours.
Students are expected to behave courteously and professionally. Disciplinary infractions will be reported to the university authorities.

Cheating/plagiarism policy:

Cheating/plagiarism is considered as a crime in this class, and will be reported to the police. The first time caught will result in the zero point with a verbal warning, and the second time caught will result in "F" grade with a police report.

Other course notes

Introduction to Numerical Methods, MIT (http://ocw.mit.edu/courses/mathematics/18-335j-introduction-to-numerical-methods-fall-2004/index.htm, http://ocw.mit.edu/courses/mechanical-engineering/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/lecture-notes/)
Introduction to Numerical Methods, Prof. Jun Zhang, U of Kentucky, http://www.cs.uky.edu/~jzhang/CS321/cs321.html
Numerical analysis by Professor Peter Oliver, U of Minnesota (http://www.math.umn.edu/~olver/num.html)
Numerical method by Prof. Stuart Dalziel, U of Cambridge
(http://www.damtp.cam.ac.uk/lab/people/sd/lectures/nummeth98/contents.htm)

Tentative Class Schedule (subject to changes)

Week	Date	Subject	Remark
1	8/17	Introductions: numbers and algebra	
	8/19	Taylor series and error analysis	
2	8/24	Linear algebra	
	8/26	Matrix operations	
3	8/31	Solve linear equations	
	9/2	Least square and curve fit	
4	9/7	No class (labor day)	
	9/9	MS Excel: writing formulas using operators and logics	
5	9/14	MS Excel: Entering and editing text/constants	
	9/16	MS Excel: numerical integration	
6	9/21	MS Excel: numerical derivative	
	9/23	Matlab: introduction	
7	9/28	Matlab: variable and variable arithmetic	
	9/30	Matlab: matrices and matrix arithmetic	
8	10/5	Matlab: control structures	
	10/7	Review	
9	10/12	No class (fall break)	
	10/14	Midterm exam	
10	10/19	Matlab: program development using m-files	
	10/21	Matlab: file I/O	
11	10/26	Matlab: data plotting (two-/three-dimensional plot)	
	10/28	Matlab: data plotting (two-/three-dimensional plot)	
12	11/2	Matlab: logical statements	
	11/4	Matlab: linear matrix equations	
13	11/9	Matlab: integration	
	11/11	Matlab: minimization	
14	11/16	Matlab: curve fit	
	11/18	Matlab: ordinary differential equation solver	
15	11/23	Matlab: Image processing	
	11/25	No class (Thanksgiving)	
16	11/30	Matlab: numerical analysis	
	12/3	Final Exam	
	12/11	Final Project Due, 5pm	