ENGR 141 Syllabus Specifics – Fall 2010

Course Meeting Times and Instructor Information

Section	Day	Time	Room	Instructor	USERID
041	W F	1:25 – 2:15 pm	Holtz B003	Prof. David Bowman	dbowman
041 L	M T	M: 1:25 – 2:15 pm T: 12:30 – 1:20 pm			

- Class will not meet on the following days:
  - Monday November 1 – Tuesday November 2 Fall Break
  - Wednesday November 24 – Friday November 26 Thanksgiving Break

Required Course Textbooks and Materials

- Thinking like an Engineer: An Active Learning Approach by E. A. Stephan, D. R. Bowman, W. J. Park, B. L. Sill, and M. W. Ohland (Prentice Hall, 2011 / ISBN-13: 978-0-13-606442-8)
- iClicker
- FE calculator

******What is an FE calculator?*** *On exams, only a calculator that meets the requirements used for the Fundamentals of Engineering (FE) exam many of you will take as seniors may be used. A list of acceptable calculators can be found here: www.ncees.org/exams/calculators/#example Calculators that are acceptable include: Casio: all fx-115 model /HP: 33 or 35 models /TI: 30X or 36X models. If you have a calculator that you think may be acceptable, please ask for clarification. DO NOT ASSUME we will have a calculator available for you to use - you are required to bring one with you! No, you will not be allowed to use your cell phone as a substitute.*

Grade Distribution

Exam 1	20%	Homework (6 @ 2%, drop 1)	10%
Exam 2	20%	In Class Activities (22 @ 0.5%, drop 2)	10%
Quizzes (6 @ 3%, drop 1)	15%	ePortfolio	3.5%
Team Project (1)	20%	Surveys (3 @ 0.5%)	1.5%

Exam Schedule

Exam dates and times are listed below. The location of the exam for your section will be posted on Blackboard. You will be divided alphabetically to take the exam. Make sure you know where the exam will be given, since it is unlikely that it will be in your usual lecture room.

- Exam 1: Tuesday, September 28 7:00 – 8:30 pm
- Exam 2: Tuesday, November 9 7:00 – 8:30 pm

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Office Hours

During the following days / times, I will be available in Holtzendorff B-05 for drop-in office hours. If these times do not work with your schedule, please email me for a one-on-one appointment.

Tuesdays, 4:00 – 5:00 pm Thursdays, 2:00 – 3:00 pm

Topical Outline

ENGR 141 Programming and Problem Solving: 3 credits (contact hours: 2 lecture, 2 lab)

Students formulate and solve engineering problems using MATLAB; estimate answers for comparison to computed solutions; read, interpret and write programs, instructions and output; iterate, evaluate conditional statements; and debug. Various forms of technical communication are emphasized. Credit toward a degree will be given for only one of ENGR 130 or 141. Preq: C E S 102; Coreq: MTHSC 106 or 107.

The approximate number of class hours and percentage of semester spent on each topic is included. Please note topics are not presented here in chronological order.

- **Course Mechanics – 10 hours - 18%**
  - Course Introduction and computer setup
  - Exams / Quizzes
  - Guest Speakers
  - Registration Advising
- **Algorithms – 2 hours – 3.5%**
  - Creating algorithms by hand
  - Creating pseudo-code algorithms
  - Drawing a flowchart of a given algorithm
- **Functions & Programs – 4 hours – 7%**
  - Anatomy of a proper function / program
  - Creating a program / function with proper documentation
  - Debugging programs / functions by generating extra output and using breakpoints
  - Definition of a function and of a program
  - Handling functions with multiple input and/or output variables
  - Statistics: creating histograms by hand and using MATLAB
  - Statistics: understanding basic statistical functions and built-in MATLAB functions such as **mean, median, minimum, maximum, var, std**
  - Syntax and order of execution for MATLAB commands
  - Syntax and order of operations for mathematical expressions
  - Understanding input and output of functions
  - Variable data types (string / number / array / matrix)
- **Input & Output – 4 hours – 7%**
  - Definition and discussion of syntax of **disp, fprintf, input,** and **menu** functions
  - Discussion of special string characters (\n, \\, %s, %f, etc)
  - Importing data (CSV, Excel, text) into MATLAB

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- **Logic & Conditional Statements – 4 hours – 7%**
  - Converting written sentences into a structured conditional statement
  - Definition and discussion of conditional statements
  - Definition and discussion of **else, elseif, end, and if** operators
  - Definition of all logical operators (&&, ||, ~, &, | (bit-wise))
  - Definition of all relational operators (**<, >, <=, >=, ~=, ==)**
  - Introduction to basic Boolean logic and basic truth tables

- **Looping Structures – 8 hours – 14%**
  - Arithmetic of looping structures – calculating number of times for loop will execute
  - Definition and discussion of **for** and **while** operators
  - Recursion

- **Vector & Matrix Operations – 4 hours – 7%**
  - Applying a built-in function to an array or matrix
  - Building and entering arrays and matrices in MATLAB
  - Definition of array and matrix
  - Discussion of matrix arithmetic (addition, subtraction, multiplication)
  - Replacing elements, rows, or columns of a matrix
  - Solving simultaneous equations with **rref**
  - Term-by-term operations (multiplication, raising to a power) basics of matrix multiplication
  - Transposing matrices: definition and MATLAB operator

- **Plotting – 4 hours – 7%**
  - Creating a figure with a single plot with multiple data series on the plot
  - Creating a figure with multiple plots using **subplot**
  - Creating proper plots with MATLAB using built-in functions (**title, xlabel, ylabel, legend, axis, grid, markers**)
  - Discussion of **plot** and **fplot** functions

- **Data Collecting & Processing – 4 hours – 7%**
  - Calculating amplitude, period, horizontal/vertical shift of sinusoidal data
  - Discussion of data smoothing algorithms – noise removal
  - Discussion of effects of sampling data
  - Finding zeroes, minima, maxima of a data set

- **Experimentation and Analysis – 12 hours – 21%**
  - Collecting and analyzing laboratory data using MATLAB
  - Past experiments have included:
    - Developing a mathematical model for the stiffness of a beam
    - Examining the effects of changing parameters on a vibrating beam
    - Sum of forces on a simple cantilever beam

- **Project – 3 hours – 5%**
  - Design a system, component, or process to meet desired needs
  - Function on multi-disciplinary teams
  - Main bulk of work on project is done outside of class

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Course Objectives

The main goals of this course are:

- *to **prepare** students for the **rigor of future engineering classes**,*
- *to **provide** students with a **solid foundation of basic engineering skills**, and*
- *to **introduce** students to the **different engineering majors and career options***

Upon completion of this course, you will be able to:

Course Objectives	ABET
Communicate technical information effectively by correctly apply graphing conventions and composing clear and concise descriptions of experiments and projects;	**g**
Formulate and justify a solution to an engineering problem within a team structure	**d** **e**
Generate a written (numbered list/pseudo code) description and sketch a flowchart/concept map of an algorithm of a problem or process.	**c** **e**
Formulate algorithmic steps into code utilizing input instructions, formatted output, looping structures, conditional statements, and file input/output.	**a** **e**
Read, write, interpret, and debug MATLAB programs and functions. Trace the value of variables through MATLAB program and function execution. Verify output against a published or manually calculated solution.	**e** **k**

ABET Competencies

This course is designed to satisfy the following ABET Competencies. For more information, please refer to http://www.abet.org.

Engineering programs must demonstrate that their graduates have:

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs

(d) an ability to function on multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand impact of engineering solutions in global and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice