Individually Negotiated Honors Option Proposal

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Fall 2008

Computer Programming for Engineers ENGG 010
CRN# 90059

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OVERVIEW OF THE COURSE

ENGG 10 is a three-credit, freshman-level computer programming course for engineering students. A copy of the syllabus for the Spring 2008 semester is attached. The topics on the Fall 2008 syllabus will be similar. However, the Fall 2008 course will include coverage of Microsoft Excel as well as the MatLab programming language.

ELEMENTS OF THE INHO

(Note: In the below description, "HS" designates the honors student.)

General

1) The class meets twice a week in the Engineering computer lab. Homework is assigned once per week and usually consists of two or three computer problems to be completed by the students and submitted one week after assignment. The problems are chosen from the textbook, from other reference texts, or have been custom-generated by the instructor. The HS will be assigned an additional problem per week. This problem will be on the same topic as the HW assigned to the other students. However, it will typically require more reflection to achieve successful completion.

2) The HS will meet weekly with the instructor. At this meeting, the HS will advise the instructor of his/her progress in achieving the requirements of the INHO. The instructor will provide the HS with any necessary assistance and direction.

Specific

In addition to the extra homework and the meetings discussed above, the HS will be assigned projects which are extensions of the normal course curriculum. With two exams plus a final, the course is naturally divided into three parts of about the same length. The work specifically assigned to the HS will be distributed over all three segments of the course. The expected projects are as follows (subject to possible revision as the semester progresses):

First Segment of the Course

a) The HS will investigate the "switch-case" statement. This is an additional statement which can be used to affect the flow through a computer program. The HS will be assigned one or two problems requiring use of the switch-case statement.

b) "Looping" is a method to alter the flow through a computer program. The same group of commands are repeated several times consecutively. Loops can also be nested – one loop within another loop. The HS will be assigned a problem involving nested loops. This problem will involve more degrees of nesting than the problems assigned to the other students in the class. Increased logical thought will be needed to successfully solve the problem.

Second Segment of the Course

a) One topic in this segment is the solution of simultaneous linear equations. The students derive the equations for an engineering problem and solve them simultaneously for the values of the variables in the problem. The coefficients in the problem are constants. The HS will solve a set of equations where the coefficients are not constant, but are functions of another parameter. For example, the problem may be from the field of heat transfer, and the coefficients in the problem will not be constant, but will rather be functions of temperature.

b) The course includes solution of simultaneous ***linear*** equations, but not the solution of simultaneous ***non-linear*** equations. With the omission of non-linear equations from the course, students may erroneously conclude that all problems in engineering can be reduced to linear form. The HS will become acquainted with problems which cannot be adequately modeled by linear systems of equations. He/she will learn the commands needed to solve systems of non-linear equations and will be assigned a problem from this topic.

Third Segment of the Course

a) This segment includes the topic of the fitting of mathematical functions to experimental data. In his laboratory work, the instructor has noticed that the experimental data obtained does not always agree with empirical relations found in textbooks. The instructor is currently performing experiments to quantify the amount of the discrepancy and to determine the reason(s) for the discrepancy. The HS will work with the instructor to analyze the data obtained by the experiments. He/she will determine the function which best fits the data and will compare the data with the predictions of the equations in the referenced texts. The HS and the instructor will consider the magnitude of the discrepancy and discuss possible reasons for it.

b) The HS will be assigned a problem dealing with a first-order differential equation. This is an advanced topic outside the normal scope of the course. In addition to learning

how to numerically solve such an equation, the HS will gain insight into how the equation has been derived from the fundamental laws of physics and engineering.

GRADING

Grading for the course is 75% exams and 25% homework. The grading will be similar for the HS, except the homework portion of the grade will also include the extra homework problems assigned to the HS. The student's performance on the specific projects noted above will be evaluated to determine whether the performance warrants an honors designation. The student's participation in the weekly meetings with the instructor will also be considered in the determination of the honors designation.

INSTRUCTOR'S SUMMARY

An INHO has been developed for ENGG 10, "Computer Programming for Engineers". It has been designed to provide an intellectually stimulating experience for the student while still being of reasonable length and effort. The HS will be doing additional work, work that is often at a deeper thought level compared to the work of the other students in the course. The HS will also be exposed to advanced topics outside of the normal syllabus of the course. Finally, the HS will work with the instructor in the evaluation of data obtained from the instructor's research. The INHO should prove to be an enhanced educational experience for the student that is very worthy of the honors designation.

SYLLABUS

ENGG 10
Computer Programming for Engineers
Spring 2008
Dr. Forsberg (eggchf@hofstra.edu)

(Syllabus may be revised during the semester. Topic sequence as shown below may not be completely accurate since text will often be used as a reference book and topics are often not covered in the order presented in the text.)

Text: "MATLAB An Introduction with Applications" Amos Gilat, 3rd Ed., 2008, Wiley

Major Topics

Chpt. 1 Starting with MATLAB	Textbook Page
1.1 Starting MATLAB, MATLAB windows	5-8
1.2 Working in the Command Window	9-10
(Enter, clc, semi-colon, %)	
1.3 Arithmetic Operations with Scalars	10-12
Hierarchy (Order of Precedence)	
1.4 Display Formats	12-13
1.5 Elementary Math Built-In Functions	13-16
1.6 Defining Scalar Variables	16-18
Assignment Operator	
Variable Names	
Predefined Variables (ans, pi, NaN)	
1.7 Useful Commands (clear, who)	19
Chpt. 1 & 4 Script Files (M-Files, Program Files)	
1.8 & 1.9 Script Files	20-27
4.1 Workspace Window	86-87
	77-81
4.2 Input to a Script File	87-90
input command	
4.3 Output Commands	91-92
disp command	
Chpt. 7 Programming in MATLAB	
Flowcharts	Notes
7.1 Relational and Logical Operators	191-200
Hierarchy (Order of precedence)	
7.2 Conditional Statements	200-205
if-end	