

ENGR 2010 – Computational Modeling (Computing Techniques)
Engineering Studies Program
Armstrong Atlantic State University
Fall 2010

GENERAL INFORMATION

Class Hours: TR 01:00 p.m. – 02:15 p.m.

Class Location: Science Center # 2016

Instructor: Dr. Priya T. Goeser

Office: Victor Hall # 209

Phone: 912-344-2874

Email: Priya.Goeser@armstrong.edu

URL: <http://engineering.armstrong.edu/priya>

Office Hours: M 09:00 a.m. – 10:00 a.m.,
T 10:00 a.m. – 11:30 a.m. and 02:30 p.m. – 04:00 p.m.,
W 09:00 a.m. – 10:00 a.m. or by appointment

Text book: Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale (6th Edition)

References:

- MATLAB - An Introduction with Applications by Amos Gilat
- Engineering Computation with MATLAB by David Smith

Course URL: <http://engineering.armstrong.edu/priya/ENGR2010/ENGR2010.html>

PREREQUISITES

MATH 2072, PHYS 2211 and either ENGR1371/CSCI1371 or ENGR1171 (accepted as a co-requisite)

CATALOG DESCRIPTION

Fundamentals of numerical methods and development of programming techniques for solving engineering problems via computers.

TOPICS COVERED

- Introduction to mathematical modeling and numerical solution of engineering problems
- Numerical errors – Computer representation of real numbers; accuracy, precision and round-off errors; Taylor series; truncation errors
- Roots of equations – Bracketing and open methods
- Linear algebraic equations – Gaussian elimination; LU decomposition
- Curve fitting – Least squares regression methods;
- Interpolation - Polynomial interpolation; spline interpolation
- Numerical integration – Trapezoidal rules; Simpson's rules;
- Numerical differentiation – finite difference rules
- Ordinary differential equations – Euler's methods; Runge-Kutta methods
- Optimization – Golden section search

- Introduction to signal processing

Note that the above topics are tentative and the instructor can change them if and when needed.

COURSE OUTCOMES

Upon successful completion of this course, students should be able to demonstrate the following outcomes.

1. The development and use of computer software for solving engineering problems:
 - 1.1. The ability to write efficient computer programs using MATLAB, a programming language used for technical computing.
 - 1.2. The ability to write well-structured and well-documented computer programs.
 - 1.3. The ability to use these computer programs to solve simple engineering problems.
 - 1.4. The ability to present the results of these computations using the graphical capabilities of MATLAB.
2. The formulation and solution of engineering problems using numerical methods:
 - 2.1. An understanding of several numerical methods used in mechanical engineering.
 - 2.2. The ability to translate a numerical algorithm to a working MATLAB program.
 - 2.3. The ability to formulate simple mathematical models of engineering problems.
 - 2.4. The ability to use these numerical methods and mathematical models (computational models) to solve engineering problems using a computer.
 - 2.5. The ability to present the results and solutions to these problems in a well-written technical report.
3. The analysis, presentation and visualization of data:
 - 3.1. An understanding of the concepts of curve fitting, interpolation and signal processing.
 - 3.2. The ability to process, analyze and represent data from a real world or laboratory experiment or process in various forms.

GRADING POLICY

The grading policy will be based on:

Projects – 20%
Exam 1 – 10%
Exam 2 - 20%
Exam 3 – 20%
Final Exam – 30%

Final grades will be assessed as:

A - (90 - 100)
B - (80 - 89)
C - (70 – 79)
D - (60 – 69)
F - (< 60)

The instructor reserves the right to adjust the grading percentages and scale if needed.

HOMEWORK AND IN-CLASS ASSIGNMENTS

Homework and in-class assignments will be a combination of written and programming exercises. Assignments will be assigned once every 1-2 weeks. Assignments are for practice only and are not included in the grading policy (unless specified otherwise). However, students are expected to work through all problems covered in these assignments.

PROJECTS

Projects will be a combination of written and programming exercises based on the homework assignments and other material covered in class. Projects will usually be due 1-2 weeks from the date they are assigned. All projects are to be submitted in the required format. Late work and missed work will automatically get a zero for that particular project.

EXAMS

Exams will be closed book and closed notes and are to be individual effort. Exams will cover all course material (lectures, handouts, reading assignments, etc.) up to the class period before the exam. No makeup exams will be given except for an emergency situation (written documentation required).

COMPUTER LABS

College of Science and Technology Labs (SC 129 and SC 2016) have Microsoft Office, MATLAB, AUTOCAD, SolidWorks, Adobe Acrobat Reader and other engineering software.

CLASS ATTENDANCE

Students are expected to attend class, bring their textbooks, writing material, external storage media, etc., and are responsible for all topics covered in class. Disruption of class (using cell phones, playing on the computer, talking, sleeping, etc.) will not be tolerated. A warning will be given the first time and you will be asked to leave the class on further instances.

CLASS TARDINESS

Students are expected to come to class on time. A tardiness of five minutes after class start time will be allowed. After that you will be asked to leave the class except for an emergency situation (with the instructor's approval; written documental required).

DISABILITIES OR SPECIAL NEEDS

If you have a physical, psychological, and/or learning disability that might affect your performance in this class, please contact the Office of Disability Services located in the Division of Student Affairs in MCC 207 (912-344-2744 or <http://www.sa.armstrong.edu/Disability/>) as soon as possible. The Office of Disability Services will determine appropriate accommodations based on testing and medical documentation. Please notify the instructor that you might need accommodations within two weeks of the start of the semester or two weeks of being diagnosed. Please see the instructor privately after class or in his/her office. You may then choose, by notifying the instructor before the start of each exam or assignment, whether you will need any accommodation. Notification after the start of an exam or last minute notification on an assignment will not be accepted.

ACADEMIC HONESTY

Students must abide by the Armstrong Atlantic Honor Code and Student Code of Conduct <http://www.sa.armstrong.edu/Activities/hccoc.html>. Students are expected to perform their work individually unless otherwise specified by the instructor. Students may discuss assignments/projects in general terms with other students and may receive assistance from the instructor or classmates. Assistance does not mean obtaining working designs or solutions and

modifying them; this is considered copying. All instances of academic misconduct will receive a zero for the assignment/project and be reported to the Dean of Students. A second instance of academic misconduct will result in an automatic F in the course and possible disciplinary action.

IMPORTANT DATES

Exams 1-3: During regular class hours (actual dates will be announced later in class)

Final Exams: Wednesday, December 8th – Tuesday, December 14th

First day of classes: Monday, August 16th

Last day to withdraw without automatic grade of WF (Mid-term): Wednesday, October 6th

Last day of classes: Monday, December 6th

No class: Monday, September 6th, Labor Day

No class: Monday, October 11th – Tuesday, October 12th, Fall Break

No class: Wednesday, November 24th – Friday, November 26th, Thanksgiving Break

Last updated: 08-03-10.