

## **ENGR 2050: Computing Applications in Engineering**

This course is required for all engineering majors.

Course Coordinator:

William E. Howard

Catalog Description:

Application of modern programming tools and languages to solve engineering problems.

Course Structure:

Two 50-minute lectures and one two-hour laboratory/recitation session per week (three credits)

Prerequisites:

ENGR 1012 Engineering Graphics

Required Materials:

1. Course package *Engineering Computation: An Introduction Using MATLAB and Excel*, by Musto, Howard, and Williams. Custom publication of McGraw-Hill, available at the ECU bookstore.
2. MATLAB Student Version, The MathWorks.

Students are expected to have a laptop computer per engineering program requirements, with Microsoft Office and SolidWorks software installed.

Course Learning Outcomes:

Upon completion of this course, students shall be able to:

- Draw flow charts to illustrate computer algorithms
- Write programs in MATLAB utilizing loop and logic structures
- Troubleshoot MATLAB files and correct common programming errors
- Use Excel to perform engineering calculation and display results
- Create XY graphs with MATLAB and Excel
- Curve-fit data with MATLAB and Excel
- Find the roots of equations using MATLAB and Excel
- Perform numerical integration with MATLAB and Excel
- Add and multiply matrices by hand and with MATLAB and Excel
- Solve systems of linear simultaneous equation with MATLAB and Excel
- Solve constrained optimization problems with Excel Solver
- Analyze data with pivot tables with Excel
- Solve vector addition problems with Excel
- Document engineering calculations and interpret results
- Select the appropriate computational tools for typical engineering problems

Lecture Topics

- Introduction to Engineering Computations (1 class)
- MATLAB Fundamentals (2 classes)
- Programming Basics (2 classes)
- Flow Charts (1 class)
- Loop Structures and Logical Expressions (2 classes)
- Excel Fundamentals (1 class)
- Graphing Data (3 classes)
- Root Finding (2 classes)
- Numerical Integration (2 classes)
- Matrix Mathematics (2 classes)
- Simultaneous Equations (2 classes)
- Optimization (1 class)

- Pivot Tables (1 class)
- Vector Mathematics (3 classes)
- Exams and review (3 classes)

Laboratory/Recitation Topics:

- MATLAB Calculations
- MATLAB Scripts and Functions
- Loop Structures
- Logical Expressions
- Graphing (2 sessions)
- Root Finding
- Numerical Integration
- Matrices
- Simultaneous Equations
- Optimization
- Pivot Tables
- Vectors

Relevant Program Outcomes:

Graduates of the Engineering Program will demonstrate

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

g) an ability to communicate effectively.

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

Professional Component Content:

Math/Science: 0; Engineering: 3 credits; General Education: 0

Assessment Requirements:

Student Work Samples

- Assignment showing use of computer programming language (Outcome k)
- Assignment showing documentation of engineering calculations (Outcome g)

Student Course Survey

Last Review:

December 18, 2007 by William E. Howard