C-ID Descriptor
Programming and Problem-Solving in MATLAB

Descriptor Details

- **Descriptor Title**: Programming and Problem-Solving in MATLAB
- **C-ID Number**: 220
- **Units**: 3
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General Description

This course utilizes the MATLAB environment to provide students with a working knowledge of computer-based problem-solving methods relevant to science and engineering. It introduces the fundamentals of procedural and object-oriented programming, numerical analysis, and data structures. Examples and assignments in the course are drawn from practical applications in engineering, physics, and mathematics.

Prerequisites

Single Variable Calculus I Early Transcendentals (C-ID MATH 210)

or

Single Variable Calculus I Late Transcendentals (C-ID MATH 211)

Corequisites

None

Advisories

None

Content

- Overview of computer systems and the MATLAB environment
- Variables, expressions, and order of operation
- Elementary functions
- Array definitions and operations
- Computational problem-solving methodology
- Pseudocode, flowcharts, and documentation
- Formatted input and output
- Data Files
- Plotting
- Selection programming structures
- Repetition programming structures
- MATLAB Functions and user-defined functions
- Recursion
- Data structures
- Sorting and searching
- Object-oriented programming
- Graphical User Interfaces (optional)

Numerical Analysis Techniques (embedded within topics above):

- Solving systems of linear equations
- Vector analysis
- Data Interpolation
- Least-squares regression and linearization
- Numerical Differentiation and Integration
- Solving ordinary differential equations
- Series approximation and error
- Solving equations of one variable
- Optimization (optional)
- Stochastic simulation (optional)

Lab Activities

Laboratory activities require students to explore and apply concepts covered in the lecture portion of the course, and should reflect a variety of practical applications in engineering and physics.

Objectives

At the conclusion of the lecture component of this course, the student should be able to:

1. Apply a top-down design methodology to develop computer algorithms.
2. Create, test and debug sequential Matlab programs, as well as programs that use object-oriented techniques, in order to achieve computational objectives.
3. Apply numeric techniques and computer simulations to analyze and solve engineering-related problems.
4. Use MATLAB effectively to analyze and visualize data.
5. Demonstrate understanding and use of standard data structures.

Evaluation Methods

Examinations which include problem-solving exercises, final examinations, projects, homework problems, laboratory assignments.

*Note that not all of the methods listed are required.

Textbooks

Introduction to MATLAB for Engineers, Palm.

Engineering Computation with MATLAB, Smith.

MATLAB Programming for Engineers, Chapman

MATLAB: A Practical Introduction to Programming and Problem Solving, Attaway.

Typical Lab Manuals:

Laboratory manuals typically developed on-site