Prepared by the Department of Engineering Sciences & Applied Technology
Date of Departmental Approval: January 11, 2017
Date Approved by Curriculum and Programs: February 15, 2017 **Effective**: Fall 2017

1. **Course Number:** ENR110
   Course Title: Engineering and Scientific Computing

2. **Description:** This course introduces students to the elements and practices of computer programming through the MATLAB computation and visualization environment. Assuming no prior background in computer programming, this course will enable one to write programs that solve problems involving the manipulation of numbers. Procedural and object-oriented programming techniques will be taught. Students will be required to complete numerous in-class examples and homework assignments. During the semester, other technical high-level programming languages (e.g., Python) will be introduced through lecture discussion.

3. **Student Learning Outcomes** (instructional objectives, intellectual skills)**:**
   Upon successful completion of this course, students are able to do the following.
   - Leverage a programming environment to create, execute, and debug a clean, efficient, and well-documented computer program.
   - Demonstrate the computational and visualization features of the MATLAB programming environment.
   - Translate a user specification into a programming language that uses functions to decompose tasks into smaller subtasks.
   - Compare and contrast 2D and 3D plots for data analysis.
   - Design a program that uses pseudocode, variables, array functions, loops, and vectorization.
   - Differentiate between unit testing, alpha, beta, and release testing.
   - Construct a hierarchy of operations for a programing language and defend why this knowledge is important.
   - Demonstrate good programming practices, including top-down design and an emphasis for clearly defining and documenting the problem to be solved.
   - Exhibit strong file management skills for organizing the components of a computer program.

4. **Credit(s):** 3 credits (3 class hours)

5. **Satisfies General Education Requirement:** No

6. **Prerequisite(s):** MAT035 (Algebra for Non-STEM) or MAT041 (Elementary Algebra for STEM), ENL108 (Critical Reading & Thinking) or satisfactory basic skills assessment scores. Students need to have a basic knowledge of the Windows operating system and file management.

7. **Semester(s) Offered:** Varies

8. **Suggested Guidelines for Evaluation:**
   The course grade will be based on weekly homework assignments; class work and participation; exam(s); and a final examination.

9. **General Topical Outline:**
   1. Introduction to MATLAB
   2. MATLAB Basics
   3. Two-Dimensional Plots
   4. Branching Statements and Program Design
   5. Loops and Vectorization
   6. Basic User-Defined Functions
   7. Advanced Features of User-Defined Functions
   8. Complex Numbers and 3d Plots
   9. Sparse Arrays, Cell Arrays, and Structures
   10. Input and Output Functions
   11. User-Defined Classes and Object-Oriented Programming
   12. Handle Graphics and Animation