

## ABET Course Syllabus

## Course Information, Textbook and Supplementary Materials

**Course Description:** Computer programming, organization of problems for computational solution, flow charts, programming; numerical methods; analysis and solution of civil engineering problems.

**Required for:** All Civil and Environmental Engineering undergraduate degree programs

**Prerequisites:** Sufficient mathematics background

**Co-Requisite:** None

**Required Textbooks:**

- *The C Programming Language*, Second Edition, by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, ISBN 0-13-110362-8.
- *FORTRAN 77 for Engineers and Scientists with an Introduction to FORTRAN 90*, Fourth Edition, 1996, by Larry Nyhoff and Sanford Leestma, Macmillan, 2012, ISBN 0-02-388631-5.
- *Matlab for Engineering Applications*, by William J. Palm III, McGraw-Hill, ISBN 0-07-047330-7.
- *Mathematica: A Practical Approach*, by Nancy Blachman, Prentice-Hall, ISBN 0-13-563826-7.

Topics Covered	Learning Outcomes
<ul style="list-style-type: none"> <li>▪ Introduction to USC computer systems, EMACS and PICO editors</li> <li>▪ Procedural languages (C, Fortran) and basic Input / Output (I/O) statements</li> <li>▪ Basic data types and algebraic expressions</li> <li>▪ File Input / Output (I/O) and logical expressions</li> <li>▪ Loops and repetitive execution</li> <li>▪ Iterative algorithms in applied mathematics</li> <li>▪ Arrays and pointers</li> <li>▪ Linear Algebra applications</li> <li>▪ Solution of matrix equations</li> </ul>	<ol style="list-style-type: none"> <li>1. Competency in the fundamentals of programming in MATLAB®           <ul style="list-style-type: none"> <li>▪ Navigate folder and files</li> <li>▪ Understand types of numbers (integer and floating point), character strings, logical (Booleans), etc.</li> <li>▪ Understand the concept of a computer algorithm, flow charts</li> <li>▪ Perform arithmetic and logical expressions using a computer program</li> <li>▪ Perform basic input/output operations for reading and writing data to/from a file</li> <li>▪ Understand the concepts of data structures and cell arrays</li> <li>▪ Perform basic plotting and graphing functions.</li> <li>▪ Use vectors and matrices to store and retrieve data</li> <li>▪ Develop functions and sub-functions to perform some task</li> <li>▪ Use conditional statements to handle optional parts of an algorithm</li> <li>▪ Use loops to perform repeated tasks</li> <li>▪ Use the built-in debugger to follow the flow of code and debug code</li> <li>▪ Understand the concept of different workspaces for each function as well as base and global workspaces</li> <li>▪ Understand how to use recursion to solve numerical problems</li> <li>▪ Understand the limited precision of floating point math and how it impacts numerical solutions.</li> <li>▪ Use inline functions and function handles to pass arbitrary (anonymous) functions to another function</li> </ul> </li> <li>2. Ability to design algorithms for solving problems in civil engineering.           <ul style="list-style-type: none"> <li>▪ Develop a numerical algorithm from a set of given instructions or procedures</li> <li>▪ Debug an existing numerical algorithm</li> <li>▪ Write code in a style that is easily humanly readable</li> </ul> </li> </ol>

- Programming with functions
- Introduction to Object Oriented Programming (C++, Visual Basic)

3. Understand numerical algorithms: sorting, roots of equations, numerical integration, and solving linear equations
- Sort numbers
  - Find the roots of an equation
  - Perform numerical integration
  - Solve a set of linear equations in multiple unknowns

**CE 108**

**Introduction to Computer Methods in Civil Eng. 2 Units**

USC | SONNY ASTANI DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

**Lecture and Lab Schedule**

<b>Lecture</b>		<b>Lab</b>	
Sessions per Week	Duration per Session	Sessions per Week	Duration per Session
1	1 hour	1	1 hour

**Relation of Course Objectives to Program Outcomes**

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course contributes to the program outcomes as outlined in the adjacent table.

<b>Course Contribution to Program Outcomes (a-k)</b>	<b>Key</b> ✓
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

**Course Coordinator:** Dr. Erik Johnson  
Professor of Civil Engineering

**Revised:** Fall 2014