

## ABET Course Syllabus

## Course Information, Textbook and Supplementary Materials

**Course Description:** Fundamentals of analog and digital computers; simulation of nonlinear physical systems; numerical analysis and solution of engineering problems.

**Required for:** BSCE, BSCE Structural, and BSCE Building Science

**Prerequisites:**

CE 108 Introduction to Computer Methods in Civil Engineering  
MATH 245 Mathematics of Physics and Engineering I

**Co-Requisite:** none

**Required Textbook:**

Chapra, S. C. and R. P. Canale. *Numerical Methods for Engineers*. 6<sup>th</sup> ed. McGraw-Hill, 2010.

**Reference:** none

Topics Covered	Learning Outcomes
Computer methods used in civil engineering; basic experimental methods as a companion means of analysis applied in solving real word engineering and structural problems	Students will have learned: <ol style="list-style-type: none"> <li>1. Procedural languages such as FORTRAN; Flowcharts</li> <li>2. To solve nonlinear algebraic equations</li> <li>3. To solve sets of equations (linear and nonlinear)</li> <li>4. Interpolation</li> <li>5. Numerical differentiation</li> <li>6. Numerical integration</li> <li>7. Monte Carlo techniques</li> <li>8. Numerical solutions of ordinary differential equations</li> <li>9. Solution of boundary-value problems and characteristic-value problems</li> <li>10. Curve-fitting and approximation of functions</li> <li>11. Development of numerical algorithms for a given set of instructions or procedures</li> <li>12. Creation of flow-charts as illustrations of numerical algorithms</li> <li>13. Translation of flow-charts into executable computer programs</li> <li>14. Application of computer algebra programs for symbolic manipulation</li> </ol>
Algorithms for solving linear and nonlinear algebraic equations, numerical interpolation, differentiation and integration	<ol style="list-style-type: none"> <li>15. To create computer programs for solving linear and nonlinear algebraic equations</li> <li>16. To create computer programs for numerical interpolation, differentiation and integration</li> </ol>
Algorithms for Monte Carlo Techniques, Curve-fitting and approximation of functions	<ol style="list-style-type: none"> <li>17. To create computer programs for applying Monte Carlo techniques for simulating random phenomena</li> <li>18. To create computer programs for Curve-fitting &amp; approximation of functions</li> </ol>

Topics Covered	Learning Outcomes
Solutions of ordinary differential equations and boundary and characteristic value problems	19. To create computer programs for finding numerical solutions of ordinary differential equations. 20. To create computer programs for solving boundary and characteristic-value problems

**CE 402**

**Computer Methods in Engineering**

**3 Units**

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Lecture and Lab Schedule			
Lecture		Lab	
Sessions per Week	Duration per Session	Sessions per Week	Duration per Session
2	1.5 hours	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.

Course Contribution to Program Outcomes (a-k)	Key
i. Recognition of the need for, and an ability to engage in life-long learning.	
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

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