

Tennessee Technological University  
Department of Civil & Environmental Engineering  
CEE 3100 – Computers in Civil Engineering  
Elective  
Spring Semester 2008

2007 Catalog Data:	CEE 3100. Computers in Civil Engineering. Lecture 2. Lab 2. Credit 3. Computer applications to solve civil engineering problems; algorithmic structuring; numerical methods; error analysis. Prerequisite: ENGR 1120 and MATH 2110.
Textbook:	Chapra, S.C. and Canale, R.P. <i>Numerical Methods For Engineers with Software and Programming Applications</i> , McGraw-Hill, Inc.
Reference:	Byron Gottfried, <i>Spreadsheet Tools for Engineers using Excel</i> , Third Edition, Mc-Graw-Hill
Coordinator:	Faisal Hossain, Assistant Professor of Civil Engineering
Goal:	The goal of CEE 3100 “Computers in Civil Engineering” is to promote use of computers in solving civil engineering problems, and to develop understanding of capabilities and limitations of computing techniques.

Course learning objectives:

1. The student is to acquire skills in applying numerical techniques to practical engineering problems.
2. The student is to acquire skills in algorithmic structuring of typical analysis problems in civil engineering.
3. The student is to acquire skills and experience in using mathematical and programming software tools to analyze data and solve practical problems in civil and environmental engineering.
4. The student is to acquire skills and strategies for graphical presentation and analysis of empirical data.

Course measurable outcomes:

Students will be expected to:

1. develop skills in applying numerical techniques to solve practical engineering problems;
2. develop skills in algorithmic structuring of typical problems in civil engineering;
3. develop skills and experience in using mathematical and programming software tools to analyze data and solve practical problems in civil engineering; and
4. develop skills and strategies for graphical presentation and analysis of empirical data.

Topics covered: (2 lecture classes per week, 55 minutes each)

1. Introduction and examples of CEE problems (1 class)
2. Programming and algorithmic structuring concepts (2 classes)
3. Review of computing software (Excel Spreadsheet, MATLAB) (5 classes)
4. Errors and approximation (3 classes)
5. Roots of equations (3 classes)
6. Solving systems of linear and non-linear equations (6 classes)
7. Regression and Curve fitting (3 classes)
8. Numerical Integration and Differentiation (3 classes)
9. Tests (2 classes)

Contribution of the course to meeting professional component:

This course is a part of the engineering topics component of the curriculum and includes a laboratory.

ABET category content as estimated by faculty member who prepared this course description:

Engineering Science: 3 credits or 100%  
Engineering Design: 0 credits or 0%

Relation of course to program outcomes:

- Outcome 1: The graduates will have a broad understanding of relevant principles of mathematics, science, and engineering.
- Outcome 4: The graduates will be capable of design activities and have the ability to identify, formulate, and solve engineering problems.
- Outcome 8: The graduates will have the ability to use techniques, skills, and modern engineering tools needed for engineering practice.
- Outcome 10: The graduates will have an understanding of the need to continue their education through life-long learning.
- Outcome 11: The graduates will have an understanding of the importance of fundamental and applied research in the advancement of engineering knowledge.

Relation of course to ABET Criteria:

<u>General Criteria</u>	Bloom's Level of Achievement
(3a) Knowledge of math, science, engineering	3
(3e) Identify, formulate, and solve engineering problems	3
(3k) Techniques, skills, modern tools for engineering practice	3

<u>Program Criteria</u>	Bloom's Level of Achievement
1. Apply knowledge of math and sciences	3
2. Apply knowledge of four technical areas appropriate to civil engineering	3

Computer (software) usage:

1. The course is designed to be "paper-free" as much as possible. All lectures, laboratory sessions, assignments, quizzes and exams will be conducted and exchanged using computer resources.
2. All of the laboratory assignments are completed on computers. Students will use combinations of software and programming tools to solve and analyze applications in civil and environmental engineering, such as excel, Matlab, MATHCARD and Fortran programming.

Laboratory projects:

There is one laboratory session per week. Laboratory sessions will be conducted to supplement the class lectures and help students develop skills in using various computing software. The 14 laboratory assignments are as follows:

- i) Assessment of prior knowledge of computing techniques
- ii) Data Entry/Manipulations
- iii) Efficient computation of statistics from large databases
- iv) Roots of a equation
- v) Solving Systems of Equations
- vi) Least Squares estimation (curve fitting)
- vii) Gaussian Elimination
- viii) Error estimation
- ix) Numerical Integration
- x) Numerical Differentiation
- xi) Understanding and reviewing algorithms generically in MATLAB
- xii) Understanding and reviewing algorithms generically in MATHCAD
- xiii) Understanding and reviewing algorithms generically in FORTRAN
- xiv) Systematic identification of bugs in a program