CEE 175 CEE Computer Applications

Catalog data:	20-CEE-175. CEE Computer Applications. 3 ug. cr. Introduction to college computing facilities, application, software, basic concepts of computer programming and application of computer solutions in civil and environmental engineering.
Prerequisites:	None
Textbook:	Numerical Methods for Engineers: with Software and Programming Applications, 4th edition, S.C. Chapra and R. P. Canale, McGraw-Hill Companies, Inc., 2002
References:	None
Coordinator:	Dr. Margaret J. Kupferle, Assistant Professor of Environmental Engineering, 701H ERC, 556-3329, Margaret.Kupferle@uc.edu
Goals:	Introduce fundamental numerical methods to solve mathematical models and the use of computer software for simulation and advanced numerical solution of mathematical models used in engineering.
Lecture or lab topics:	1. Mathematical modeling, and type of software (7 hours) • Definition of mathematical models. • Motivation and learning objectives. • Analytical and numerical solution to mathematical models: Finite-Divided-Difference approx of derivatives (Euler's method). • Conservation laws in Engineering: conservation of mass. 2. Root Finder equations (5 hours) • Graphical and analytical methods. • Numerical methods:Fixed-point iteration and Newton-Raphson method. 3. Optimization (6 hours) • Definition • Optimization and engineering practice • One-dimensional unconstrained optimization: Quadratic interpolation and Newton's method. • Constrained optimization 4. Curve fitting (6 hours) • Linear and non-linear regression. • Linearization of nonlinear equations. • Non-linear parameter estimation. 5. Ordinary differential equations (ODE) (6 hours) • Solve ODE using Berkeley Madonna • Simulation algorithms (Euler's method, 2nd-order Runge-Kutta and 4th-order Runge-Kutta.
Computer Usage:	MatLab and Excel
ABET criterion 3:	a, b, e, k
ABET criterion 8:	a
Date prepared:	March, 22 2004, Last Update : April 25, 2007