School of Computing
UNIVERSITY OF GEORGIA

Course Information Sheet
CSCI 4140
Numerical Methods and Computing

Brief Course Description
(50-words or less)

Numerical methods and computing. Topics include: computer arithmetic; numerical solutions of nonlinear equations; polynomial interpolation; numerical differentiation and integration; numerical solutions of systems of linear equations, initial and boundary value problems, systems of ordinary differential equations, spline functions, and the method of least squares.

Pre-Requisites and/or Co-Requisites

CSCI 1302
Software Development in Java
MATH 2250(Calculus I)

MATH 3000 (Co-Requisite) Introduction to Linear Algebra

Author(s): Ward Cheney and David Kincaid
Title: Numerical Methods and Computing
Edition: Fifth Edition
ISBN-13: 0-534-8993-7

Specific Learning Outcomes (Performance Indicators)

This course presents topics in numerical methods for students studying computer science and/or engineering. At the end of the semester, all students will be able to do the following:

1. Distinguish between representations of real and integer numbers inside the computer memory.
2. Solve nonlinear equations by using various numerical methods such as the Newton's method.
3. Interpolate table of values by using polynomial interpolation.
4. Find integration of functions by numerical methods such as Simpson's method as an example.
5. Find first and higher derivatives by using finite difference methods.
6. Solve linear system of equations by Gaussian elimination.
7. Solve first and second order initial and boundary value problems by using various numerical methods such as the RK method.
8. Solve systems of ordinary differential equations by the RK method.

ABET Learning Outcomes

Graduates of the program will have an ability to:

A. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
B. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
C. Communicate effectively in a variety of professional contexts.
D. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
E. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
F. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Relationship Between Course Outcomes and ABET Learning Outcomes

	ABET Learning Outcomes						
Specific Learning Outcomes		A	B	C	D	E	F
	1	●	●	●	●	●	●
	2	●					●
	3	●					●
	4	●	●				●
	5						●
	6					●	●
	7					●	●
	8	●	●	●			●

Major Topics Covered
(Approximate Course Hours)

3 credit hours = 37.5 contact hours
4 credit hours = 50 contact hours

Note: Exams count as a major topic covered

Computer Arithmetic (4-hours)
Sources of errors (2-hours)
Numerical solutions of nonlinear equations(4-hours)
Polynomial interpolation(2-hours)
Numerical differentiation (3-hours)
Numerical integration: Trapezoid method, Simpson's and quadrature rules(3-hours)
Numerical solutions of systems of linear equations (8- hours)
Initial and boundary value problems (10 hours)
Systems of ordinary differential equations (4 - hours)
Spline functions (1 hour)
The method of least squares(1-hour)
Exams (6-hours)

Course Master

Dr. Thiab Taha

Course History

Modified by Dr. Thiab Taha on Jan 1, 2024