The University of Georgia

Department of Computer Science

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.
Extended Course Description / Comments	N/A
Pre-Requisites and/or Co-Requisites	CSCI 1302 (Pre-Requisite) Software Development in Java MATH 2250 (Pre-Requisite) Calculus I MATH 3000 (Co-Requisite) Introduction to Linear Algebra
Required, Elective or Selected Elective	Selected Elective Course
Approved Textbooks (if more than one listed, the textbook used is up to the instructor's discretion)	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

Relationship Between Student Outcomes and Learning Outcomes

		Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Learning Outcomes		●								●		
		●	●							●		
		●	●							●		
		●	●							●		
		●	●							●		
	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 (1hour)
The method of least squares (1-hour)
Exams (6-hours)

Course Master Dr. Thiab Taha