The University of Georgia

Department of Computer Science

Course Information Sheet

CSCI 2150

Introduction to Computational Science

Brief Course Description
(50-words or less)

Basic topics of scientific computing that are necessary for science and engineering students. Solving mathematical problems by different numerical methods. Quantitative reasoning concepts will be emphasized in comparing and verification of the correctness of the solutions. Mathematical software packages will be used. This course is intended for freshman and sophomore students.

Extended Course Description / Comments

This course fulfills Area III (Quantitative Reasoning) requirements. Introduction to Matlab and other software packages for numerical and symbolic manipulation, computer arithmetic, solutions of systems of equations, differentiation and integration, root finding, interpolation and curve fitting.

Pre-Requisites and/or Co-Requisites

MATH 1113
Pre-Calculus

Or Permission of Department

Approved Textbooks

No text book. The instructor will use his own notes.

Specific Learning Outcomes (Performance Indicators)

This course presents topics in mathematics that are most relevant to students studying science and engineering. At the end of the semester, all students will be able to do the following:

1. Use matlab for manipulating matrices.
2. Use matlab/maple for symbolic computation, such as finding the Taylor series of a function and evaluate its value at a certain point.
3. Distinguish the difference between the representation of floating point and integer numbers in the computer memory.
4. Distinguish between single and double precision representations of floating point numbers and compute errors when floating point operations are involved.
5. Compare between numerical and exact solution and validate the results.
6. Solve linear system of equations using Gaussian elimination and available software.
7. Find the roots of a nonlinear function and examine its correctness.
8. Interpolate a table of values by using polynomials.

Relationship Between Student Outcomes and Learning Outcomes

		Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Learning Outcomes	1	x								x		
	2	x								x		
	3	x								x		
	4	x								x		
	5	x	x							x		
	6	x	x									
	7	x	x							x		
	8	x	x							x		

Student Outcomes

a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
c. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
h. Recognition of the need for and an ability to engage in continuing professional development.
i. An ability to use current techniques, skills, and tools necessary for computing practice.
j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
k. An ability to apply design and development principles in the construction of software systems of varying complexity.

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

1. Introduction to Scientific computing(3 hours)
2. Introduction to Matlab and other available software packages for numerical simulations (8 hours).
3. Number systems and computer arithmetic (6 hours).
4. Solution of linear systems of equations (6 hours).
5. Differentiation and solving first order ODE (6 hours).
6. Integration and using Trapezoid rule(5 hours)
6. Root finding (5 hours).
7. Interpolation and curve fitting (5 hours).
8. Exams(6 hours)

Assessment Plan for this Course

Each time this course is offered, the class is initially informed of the Course Outcomes listed in this document, and they are included in the syllabus. At the end of the semester, an anonymous survey is administered to the class where each student is asked to rate how well the outcome was achieved. The choices provided use a 5-point Likert scale containing the following options: Strongly agree, Agree, Neither agree or disagree, disagree, and strongly disagree. The results of the anonymous survey are tabulated and results returned to the instructor of the course.

The course instructor takes the results of the survey, combined with sample student responses to homework and final exam questions corresponding to course outcomes, and reports these results to the ABET committee. If necessary, the instructor also writes a recommendation to the ABET committee for better achieving the course outcomes the next time the course is offered.

How Data is Used to Assess Program Outcomes

Each course Learning Outcome, listed above, directly supports one or more of the Student Outcomes, as is listed in "Relationships between Learning Outcomes and Student Outcomes". For CSCI 2150, Student Outcomes (a), (b) and (i) are supported.

Course Master

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Course History

Fall 2010 Course Approved
Feb 2012 Course Info Sheet Updated