The University of Georgia

Department of Computer Science

# *Course Information Sheet*

# CSCI 2150

Introduction to Computational Science

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| **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<br>PreCalculus |
| **Required, Elective or Selected Elective** | Selected Elective |
| **Approved Textbooks** (if more than one listed, the textbook used is up to the instructor's discretion) | No textbook. The instructor uses his/her 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 | | ● | | | | | | | | ● | | |
| | | ● | | | | | | | | ● | | |
| | | ● | | | | | | | | ● | | |
| | | ● | | | | | | | | ● | | |
| | | ● | ● | | | | | | | ● | | |
| | | ● | ● | | | | | | | | | |
| | 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

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)
7. Root finding (5 hours)
8. Interpolation and curve fitting (5 hours)
9. Exams (6 hours)

**Course Master**

Dr. Thiab Taha