CSCE 551: THEORY OF COMPUTATION

1. **CSCE 551: THEORY OF COMPUTATION**

2. Credit: 3-hrs; Contact: 3 lectures of 50 minutes each or 2 lectures of 75 minutes each per week

3. Instructors Drs. Duncan Buell and Stephen Fenner

4. Textbook(s) and Other Required Material: Michael Sipser, *Introduction to the Theory of Computation,* 2nd edition, Thomson Course Technology, Boston, MA, 2005.

5. Specific Course Information

   a. Catalog Description: Basic Theoretical principles of computing as modeled by formal languages and automata; computability and computational complexity. Major credit may not be received for both CSCE 355 and CSCE 551.

   b. Prerequisites: CSCE 350 or MATH 526 or 544 or 574; by topic Analysis of algorithms, Programming in a high-level language

   c. CSCE 5xx elective

6. Specific Goals for the Course

   a. LEARNING OUTCOMES: {Assessment Methods Shown in Braces}

      a.i. Describe finite state automata. {tests}

      a.ii. Measure the computational complexity of a language. {homework, tests}

      a.iii. Describe characteristics of a Turing machine {tests}

      a.iv. Demonstrate computability or non-computability using a Turing machine or reduction. {homework, tests}

   b. As an elective this course cannot be counted upon to contribute to the attainment of any student outcome.

7. Topics Covered:

   1. Algebra review

   2. Regular languages: automata, nondeterminism, regular and nonregular languages.

3. The Church-Turing thesis: Turing machines and their variants, algorithms on Turing machines.

4. Decidability: decidable and undecidable languages, the halting problem, reducibility.

5. Space and Time complexity: complexity classes, resource-bounded reducibility

Difference between Undergraduate and Graduate Work:

Graduate students are assigned more difficult problems and graded on a harder scale than undergraduates.

Syllabus Flexibility: Medium. The instructor should consult with the Graduate Committee.

Modification and Approval History:

Initial description April 1999

Revised June 2001

Revised June 2005 by Caroline Eastman to update textbook edition and revise format

Revised June 2011 by D. Buell

Revised June 2011 by S. Fenner