COMPSCI 361: Introduction to the Theory of Computation
3-credit course with 3 lecture hours per week
Course Coordinator: Murali Medidi

Textbook(s) and Supplemental Material

Catalog Description
Grammars, automata, Turing machines, decidability and complexity, language hierarchies, and normal forms. Concepts of NP completeness and reducibilities. Applications will be drawn from various areas of computer science.

PREREQ: COMPSCI 342.

Required

Goals for the Course
Successful students will be expected to:

- demonstrate their understanding of the concept of a mathematical proof by writing proofs, reading and understanding proofs, and evaluating proofs for correctness
- reduce unknown problems to known ones in order to prove/examine questions on decidability and complexity
- evaluate and explain the differences between different computational models, such as Turing Machines, Push-down Automata, Finite Automata, etc.
- design solutions for problems using the different computational models (grammars, pushdown automata, finite automata, TMs)
- determine the computability of a particular problem and prove it
- determine the NP-completeness of a particular problem, and prove it
- understand and work with grammars and representations of formal languages
- understand and intelligently discuss the relation between grammars, automata, and computation

Outcomes Addressed
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
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 trade-offs involved in design choices

Outcomes Assessed: a and j

Topics Covered
Math preliminaries and introduction
Finite Automata, Regular Expressions, and Languages
Context Free Languages and Pushdown Automata
Turing Machines
Decidability and Reductions
NP-Completeness

Grading
A letter grade is assigned to each student at the end of the course based on the numerical scores of these activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework and other assignments</td>
<td>25%</td>
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<tr>
<td>2 Midterm Exams</td>
<td>40%</td>
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<tr>
<td>Final Exam</td>
<td>35%</td>
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Curriculum Category Content (Credits)

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<thead>
<tr>
<th>Area</th>
<th>Core</th>
<th>Advanced</th>
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<tbody>
<tr>
<td>Algorithms</td>
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<tr>
<td>Software Design</td>
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<td>Computer Architecture</td>
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<td>Data Structures</td>
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<tr>
<td>Programming Languages</td>
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<tr>
<td>Other</td>
<td>3</td>
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