CSE 311 Foundations of Computing I

Credits
4.0 (3 hrs lecture, 1 hr section)

Lead Instructor
Paul Beame

Textbook

- *Discrete Math & Its Applications*, Rosen

Course Description
Examines fundamentals of logic, set theory, induction, and algebraic structures with applications to computing; finite state machines; and limits of computability.

Prerequisites
CSE 143; either MATH 126 or MATH 136.

CE Major Status
Required

Course Objectives
At the end of this course, students will be able to:

1. *express* simple mathematical concepts formally
2. *understand* formal logical expressions and *translate* between natural language expressions and predicate logic expressions
3. *manipulate and understand* modular arithmetic expressions
4. *create* simple proofs, including proofs by induction
5. *design* two-level logic circuits to compute Boolean functions
6. *design* simple finite state machines both with and without output
7. *design and interpret* regular expressions representing sets of strings
8. *recognize* that certain properties of programs are undecidable

ABET Outcomes
(a) an ability to apply knowledge of mathematics, science, and engineering
(e) an ability to identify, formulate, and solve engineering problems

Course Topics

- Propositional/Boolean logic (3-4 lecture hours)
- Predicate Logic (2 lecture hours)
- Logical Inference (2 lecture hours)
- Sets and Functions (0.5-1 lecture hour)
- Arithmetic (3-4 lecture hours)
- Mathematical Induction and Applications (5-6 lecture hours)
- Relations and Directed Graphs (1.5-2 lecture hours)
- Finite-State Machines (4.5-5 lecture hours)
- Circuits for finite state machines (1 lecture hour)
- Turing Machines and Undecidability (3-4 lecture hours)