

COURSE DESCRIPTION

Department and Course Number CMPS 341 **Course Coordinator** Parvin Hashemian

Course Title Foundations of Computer Science **Total Credits** 3

URL <http://www.ucs.louisiana.edu/~pxh3930> **Semester** 3

hours

Current Bulletin Description: Formal logic and its applications. Proof of correctness. Sets and combinatorics. Induction, recursion, and recurrence equations. Relations, functions, and graphs: Shortest path and minimal spanning tree, planarity, Eulerian paths, Hamiltonian cycles. Finite-state machines. Prereq: CMPS 261 with a minimum grade of C.

Textbook

Judith L. Gersting, *Mathematical Structures for Computer Science*, 6th edition, W.H. Freeman and Company, 2007

References

Kenneth H. Rosen, *Discrete Mathematics and its Applications*, McGraw-Hill, 5th Edition, 2002.

Course Objective

- Use logical notation to express/manipulate with objects and structures (such as sets, relations, and graphs) mathematically.
- To be able to synthesize a formal proof using different proof techniques.
- To model and analyze computational processes using combinatorial methods and graph theory concepts.

Course Outcomes

- Demonstrate knowledge of formal logic proofs using formal methods of symbolic propositional and predicate logic.
- Understand basic proof techniques and apply these techniques (proof by contradiction and mathematical induction) to prove theorems.
- Understand recurrence relations and find closed form solutions for them.
- Use mathematical and logical notation to define and recognize fundamental concepts such as sets, relations, and functions and perform operations on them.
- Calculate numbers of possible outcomes of combinatorial processes such as permutations and combinations.
- Understand the basic terminology of graph theory and model problems in computer science using graphs.

Prerequisites by Topic

- Data structures and their operations including lists, stacks, queues, tables, and trees.
- Searching and sorting techniques.
- Analysis of algorithms including run-time complexity and space complexity.
- Experience in developing software solutions to relatively complex problems.

Major Topics Covered in the Course

1. Propositional and predicate logic (4 classes)
2. Proof techniques and proof of correctness of codes (4 classes)
3. Recursive definition and solving recurrence relations (3 classes)
4. Sets and combinatorics (4 classes)
5. Relations and functions (4 classes)
6. Graphs and their representations (3 classes)
7. Graph algorithms (3 classes)
8. Finite-state machines and regular expressions (3 classes)

Laboratory projects (specify number of weeks on each)

This course does not have a laboratory project. It has several hand written assignments. Students are required to implement graph algorithm(s) each semester. (2 weeks)

Oral and Written Communications

Every student is required to submit at least 0 written reports (not including exams, tests, quizzes, or commented programs) of typically 0 pages and to make 0 oral presentations of typically 0 minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

Social and Ethical Issues

Please list the topics that address the social and ethical implications of computing covered in all course sections. Estimate the class time spent on each topic. In what ways are the students in this course graded on their understanding of these topics (e.g., test questions, essays, oral presentations, and so forth)?

N.A.

Theoretical Content

Please list the types of theoretical material covered, and estimate the time devoted to such coverage.

The entire course is theoretical. See the section entitled *Major Topics Covered in the Course*

Problem Analysis

Please describe the analysis experiences common to all course sections.

All topics in this course involve problem analysis. The exams and homework assignments consist of problems that students must solve.

Solution Design

Please describe the design experiences common to all course sections.