Rutgers University, Department of Electrical and Computer Engineering
ABET COURSE SYLLABUS
COURSE: 14:332:312

Course Catalog Description: 14:332:312 Discrete Mathematics (3)
An application-driven course based upon the study of events that occur in small, or discrete, segments in business, industry, government and the digital world. The student will be introduced to the mathematical tools of logic and set theory, combinatorics, number theory, and graph theory. Practical applications will be introduced throughout the course.

Pre-Requisite Courses: 01:640:231

Pre-Requisite by Topic:
1. Boolean Algebra
2. Combinatorics
3. General computing skills

Textbook & Materials: Kenneth H. Rosen, *Discrete Mathematics and It's Applications, Sixth edition*, McGraw-Hill, 2007

Overall Educational Objective: To develop the ability to reason and think mathematically and logically; and to apply this ability to analyzing and solving discrete practical problems.

Course Learning Outcomes: A student who successfully fulfills the course requirements will have demonstrated an ability to:

1. Count/enumerate objects in a systematic way.
2. Read, understand and construct mathematical arguments.
3. Use number theory to model practical problems.
4. Apply graph theory to solve real-world problems.

How Course Outcomes are Assessed:
Homework, Quizzes and Projects (25 %)
Two Exams (40 %)
Final Exam (35 %)

N = none S = Supportive H = highly related

Outcome	Level	Proficiency assessed by
(a) an ability to apply knowledge of Mathematics, science, and engineering	H	HW Problems, Projects, Exams
(b) an ability to design and conduct experiments and interpret data	N	
(c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	N	
(d) an ability to function as part of a multi-disciplinary team	N	
(e) an ability to identify, formulate, and solve ECE problems	H	HW Problems, Projects, Exams

(f) an understanding of professional and ethical responsibility	N	
(g) an ability to communicate in written and oral form	S	HW Problems
(h) the broad education necessary to understand the impact of electrical and computer engineering solutions in a global, economic, environmental, and societal context	S	Lectures
(i) a recognition of the need for, and an ability to engage in life-long learning	N	
(j) a knowledge of contemporary issues	N	
(k) an ability to use the techniques, skills, and modern engineering tools necessary for electrical and computer engineering practice	N	
Basic disciplines in Electrical Engineering	H	HW, Projects, Exams
Depth in Electrical Engineering	S	HW, Exams
Basic disciplines in Computer Engineering	N	
Depth in Computer Engineering	N	
Laboratory equipment and software tools	N	
Variety of instruction formats	N	

Typical Topics Covered on a Week by Week Basis:

Week 1: Course Introduction; Review of Logic Statements
Week 2: Logic Statements and Connectives, Quantifiers and Logic word problems
Week 3: Combinatorial Circuits
Week 4: Boolean Algebra
Week 5: Fundamentals of Set Theory
Week 6: Set Operations: union, intersection, complement, difference; Proofs
Week 7: Membership Tables and Venn Diagrams
Week 8: Permutations, combinations, Counting Principles
Week 9: Probability, Independence, Bayes' Theorem
Week 10: Prime Numbers and cryptography
Week 11: Divisibility and Euclidean Algorithm; Modular Arithmetic, congruence
Week 12: Concepts in Graph Theory; Euler Circuits and Path; Fleury's Algorithm; Example Applications (such as Seven Bridges of Konigsberg; Chinese Postman Problem; Instant Insanity; Three Houses-Three Utilities Problem); digraphs
Week 13: Hamilton Circuits and Paths; Gray Codes; Traveling Salesman Problem; Nearest-Neighbor Algorithm; Cheapest-Link Algorithm; RNA Chains; Tournaments
Week 14: Planar Graphs and Coloring; Circuit Testing and Facilities Design
Week 15: Trees and Networks; Kruskal's Algorithm; Steiner Points and Shortest Networks; One-Way Street Problem
Week 16: Final Examination

Computer Usage: Students will engage in programming projects

Laboratory Experiences: Students will engage in computer programming projects

Design Experiences: 30% of Homework will focus on analysis of practical problems. 20% Real-world design projects employing number theory and/or graph theory.

Independent Learning Experiences: 1. Home-Work 2.Testing (Quizzes, Exams) 3. Group Projects

Contribution to the Professional Component:
(a) College-level mathematics and basic sciences: 1.50 credit hours
(b) Engineering Topics (Science and/or Design): 1.50 credit hours
(c) General Education: 0 credit hours
Total credits: 3
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