Math 137 Discrete Mathematics
Fall 2014

Instructor's Name:

Office Location:

Office Hours:

Office Phone:

E-mail:

Course Description

A course designed for all students of mathematics with special emphasis on topics relevant for students of computer science. Included are problems on combinatorics, analysis of algorithms, set theory, graph theory, tree traversals, spanning trees, matching, networks, recurrence relations, sorting and searching, logical gates, Karnaugh maps, and finite state machines.

Illinois Articulation Initiative (IAI) number

Majors IAI Number(s): CS 915
Gen Ed IAI Number(s): M1 905

Credit and Contact Hours:

Lecture	**4**
Lab	**0**
Credit Hours	**4**

Prerequisites: ENG 101 Appropriate placement score or minimum grade of"C" in MATH 131, or MATH 138 or MATH 142 or equivalent.
Other: Satisfactory Placement Test score or grade of C in Math 131 or Math 138 or Math 142 or equivalent.

Books, Supplies, and Supplementary Materials

A. Textbooks

Required: Discrete Mathematics, 5th ed., 2007; Dossey

Publisher: Addison-Wesley

B. Other Required Materials

TI-83+ or TI-84+ graphing calculator or equivalent

Methods of Instruction:

Lecture
Online

Student Learning Outcomes: General Education Student Learning Outcomes:

1. Apply definitions, notation, theorems, properties and operations of Set Theory to solve applications.
2. Solve problems involving congruence classes.
3. Construct greatest common divisors with the Euclidean Algorithm.
4. Solve applications utilizing the theory of Graphs, Trees, Rooted Trees, Binary Trees, and Transportation Networks, Boolean Circuits and Finite State Machines.
5. Determine when graphs are isomorphic.
6. Analyze graphs using the Euler Circuit Algorithm, breadth-first search algorithm, depth-first search algorithm and Djikstra's Algorithm.
7. Analyze weighted trees and shortest path with Kruskal's algorithm.
8. Determine systems of distinct representatives from a collection of sets or prove one doesn't exist.
9. Produce maximum matchings using the Matching Algorithm and the Hungarian Method.
10. Calculate improved flows in a transportation network using the flow-augmentation algorithm.
11. Solve applications using counting principles, combinations, permutations, the pigeonhole principle and rule of product.
12. Analyze probability utilizing sample spaces.
13. Solve applications involving sequences and recurrence relations.
    Solve second order difference equations with constant coefficients.

Objectives

Upon completion of the course, the student will have worked with:

1. Existence, Counting, and Optimization problems
2. Matching problems
3. The Knapsack problem
4. Set operations
5. Equivalence classes

6. Congruence relations
7. Logarithmic functions
8. Algorithms and determining paths, including cycles and Euler circuit algorithm
9. The Welch and Powell algorithm
10. Definition of directed graphs in a study of representations and application

11. Breadth-first searches and Dijkstra's algorithm
12. Minimal spanning trees in conjunction with Prism's Algorithm and Zruskal's Algorithm
13. Binary tree searches, expression trees
14. Optimal binary tree - Huffman's Theorem
15. Matching - Hall's Theorem

16. Maximal matching algorithms; maximal independent set algorithms
17. Network flow problems
18. Pascal Triangle, Binomial Theorems
19. Combinations, Permutations
20. Sequences and recurrence relations

21. First-order linear difference equations
22. Second-order Homogeneous Difference Equations
23. Bubble, insertion, quick sort, merge sort

24. Logical Circuits, Boolean Algebra, logical gates
25. Truth tables

26. Karnaugh maps
27. Finite state machines, transition diagrams

TOPICAL OUTLINE

Week	Topic or Class Activity

The course will cover material from chapters one through 10 of the selected textbook. Some sections will be omitted.

1	Sections 1.1 – 1.4 Topics: Introduction to combinatorial problems, techniques and applications.
2 &3	Sections 2.1 – 2.6 Topics: Set operations, equivalence relations, functions, induction and applications.
4	Sections 3.1 and 3.2 Topics: Congruence and the Euclidean Algorithm.
5	Sections 4.1 – 4.5 Topics: Graphs and their representations, paths circuits, shortest paths, directed graphs and multi-graphs.
6 & 7	Sections 5.1 – 5.6 Topics: Properties of trees, spanning trees, depth first search, rooted trees, binary trees and traversals, optimal binary trees and binary search trees.

8 & 9	Sections 6.1 – 6.5 Topics: Systems of distinct representatives, matchings, matching algorithm, applications and the Hungarian method.
10	Sections 7.1 – 7.4 Topics: Flows and cuts, flow augmentation algorithm, Max-Flow Min-Cut theorem, flows and matchings.
11 & 12	Sections 8.1 – 8.5 Topics: Binomial theorem, permutations, combinations, arrangements and selections with repetitions, probability.
13	Sections 9.1 – 9.3 Topics: Recurrence relations, method of iteration, linear difference equations with constant coefficients.
14 &15	Sections 10.1 – 10.4 Topics: Logical gates, combinatorial circuits, Karnaugh maps, finite state machines.

One week left to augment any of the above chapters.

Classroom Policies and Procedures

General Information

Attendance Policy

Make-up Policy

Extra-credit Policy

Final Exam Information
A comprehensive final examination will be given.

Academic Honor Code

The objective of the academic honor code is to sustain a learning-centered environment in which all students are expected to demonstrate integrity, honor, and responsibility, and recognize the importance of being accountable for one's academic behavior.

College Statement about grades of "F" and Withdrawal from Class

Students may withdraw from a course by processing an add/drop form during regular office hours through the Registration and Records Office at Main Campus or Romeoville Campus, or by phone at 815-744-2200. Please note the withdrawal dates listed on your bill or student schedule. Every course has its own withdrawal date. Failure to withdraw properly may result in a failing grade of "F" in the course.

At any time prior to the deadline dates established, an instructor may withdraw a student from class because of poor attendance, poor academic performance or inappropriate academic behavior, such as, but not limited to, cheating or plagiarism.

Intellectual Property

Students own and hold the copyright to the original work they produce in class. It is a widely accepted practice to use student work as part of the college's internal self-evaluation, assessment procedures, or other efforts to improve teaching and learning and in promoting programs and recruiting new students. If you do not wish your work to be used in this manner, please inform the instructor.

Student Code of Conduct

Each student is responsible for reading and adhering to the Student Code of Conduct as stated in the college catalog.

Sexual Harassment Joliet Junior College seeks to foster a community environment in which all members respect and trust each other. In a community in which persons respect and trust each other, there is no place for sexual harassment. JJC has a strong policy prohibiting the sexual harassment of one member of the college community by another. See the Catalog or Student Handbook.

Student Support **http://jjc.edu/services-for-students/pages/default.aspx**

Prepared by:	Reviewed by:	
Prof. Robert Tuskey Mathematics Department	Prof. Jean McArthur Department Chair	Date

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