Passaic County Community College
Academic Year: 2023-2024
Standard Syllabus

Department Chair: Merille Siegel

Course Code: CIS 250/ MA 150 **Course Title:** Discrete Structures

Department: CIS/Engineering **Semesters Offered:** Fall Evening, Spring Day

Course Description:
This course introduces students to the theoretical foundations of Computer Science. It exposes them to reasoning in a systematic way when describing algorithms and other Computer Science applications. The students will also be introduced to a variety of topics including: sets, relations, logic proofs, functions, permutations, recursion, trees, graphs, groups, languages, finite-state machines, and computability. Offered Fall (evenings) and Spring (days) only.

Co/Prerequisites: MA 101 or MA 109 and (CIS 160 or CIS 165)

Credits: 3 **Lecture Hours:** 3 **Lab/Studio Hours:** 0 **Clinical/Fieldwork Hours:** 0

Required Textbook/Materials:
Textbooks: "Discrete Mathematics An Introduction to Mathematical Reasoning "; By Susanna EPP, Brief Edition; Brooks/Cole – Cengage Learning, 2011.ISBN 1-111-77578-8

Reference: "Discrete Mathematics"; By Richard Johnsonbaugh; Prentice Hall; 1997.

RESOURCE BIBLIOGRAPHY:

- R. Johnsonbaugh; "Discrete Mathematics"; Pearson ; 2008.
- "Discrete Mathematical Structures"; B. Kolman / R. Busby / S. Ross; Pearson; 2008.
- "Discrete and Combinatorial Mathematics An Applied Introduction" ; R. Grimaldi; Addison Wesley; 2004
- "Discrete and Combinatorial Mathematics: An Applied Introduction"; Ralph P. Grimaldi; Addison Wesley; 2003.
- " Discrete Mathematics"; J. Dossey, A. Otto, L. Spence; Addison Wesley; 2002.
- "Logic and Discrete Mathematics A computer Science Prospective"; W.K. Grassmann; J.P. Tremblay; Prentice Hall; 1996.
- "Concrete Mathematics: A Foundation for Computer Science"; R. Graham, D. Knuth; Addison Wesley; 1994.

Additional Time and Supplemental Requirements:
Based on a 15 week semester, students are expected to complete approximately 6 hours per week of assigned work outside of class.

- All assigned homework is completed out of class time. Students, who don't have a computer, can use the open lab to complete homework assignments. Students must read and enforce what they learned outside of the class.

Course Learning Outcomes:

Upon completion of this course, students will be able to:

1. Apply discrete math notations to programming Including sets, relations, and functions.
2. Apply statements and notations used in logical expressions and proofs.
3. Utilize mathematical induction in problem solving.
4. Demonstrate knowledge in combinatorial logic.
5. Utilize mathematical notations in algorithms design and analysis.
6. Apply the theory of finite state automata.
7. Implement graph theory and apply it to networking.
8. Distinguish between various tree structures including binary tree, decision tree.

General Education Outcomes: This is not a general education course.

Grading Standards:

Activity	Contribution
Homework (every chapter)	30%
Tests/ Quizzes	35%
Final Exam	30%
Attendance/Activities/Etc.	5%

Course Content:

(Schedule and suggested topics, readings, and assignments subject to change based on instructor and instructional resource)

WEEK	TOPIC
1	**Introduction** Number Systems, binary arithmetic, complements.
	Chapter 1 – Speaking Mathematically
2	**Variables, Sets, Relations and functions** Introduction to Universal, Existential and conditional statements Set-roster and set-builder notations, subsets and Cartesian Products Set relations and arrow diagrams Definition of function, machines and equality.
Quiz -1	
	Chapter 2 – The Logic of Compound Statements
3	**Logical form and logical Equivalence:** Compound statements, truth values, logical equivalence, tautologies and contradictions

4 **conditional statements:**
If-then, contrapositive, converse, inverse
Only-If, necessary and sufficient conditions

valid and invalid arguments:
Modus ponens and modus tollens
Inference, fallacies, contradictions
Gates, circuits and Boolean expressions,
Input/output tables, simplifications

Quiz -2

Chapter 3 – The Logic of Quantified Statements

5 **Predicates and Quantified statements I:**
Universal and existential quantifiers(", $)
Equivalent forms, formal and informal languages.

6 **Predicates and Quantified statements II:**
Negations of Quantified statements, relations
Among ", $ and Λ , V; Vacuous truth, conditional,
necessary and sufficient conditions.

7 **Multiple Quantifiers:**
Translating formal to informal, ambiguous
language, negations, order of quantifiers.

8 **Arguments with Quantified Statements:**
Using Universal modus ponens
and modus tollens in proof, proving
validity of arguments.

Quiz -3

Chapter 4 – Elementary Number Theory and Methods of Proof

9 **Direct proof and counterexample I & II:**
Proving and disproving universal and existential
statements, writing proofs, conjecture, generalizing
from the generic particular.

Direct proof and counterexample III & IV:
Divisibility, unique factorization theorem, division
into cases, the Quotient/Remainder theorem.

10 **Indirect Arguments – Contradiction and Contraposition:**
Proof by contradiction, argument by contraposition,
proof as problem-solving tool.

Quiz – 4

Chapter 5 – Sequences and Mathematical Induction

11 **Sequences:**
Summation and products, changing variables,
Sequences.

12 **Mathematical Inductions:**
Sum of the first n integers, sum of a geometric
Sequence, inductive reasoning

Chapter 10 – Graphs and Trees

13 **Graphs:**
Definitions and basic properties, special graphs
Degree, trials, paths and circuits.

14 **Trees:**
Definition, characterizing, binary trees and properties
Spanning trees and shortest paths

15 **Final**

College Policies:

For Information regarding:

- PCCC's Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the PCCC Student Handbook and PCCC Catalog

Panther Alert:

The College will announce delayed openings, closings, and other emergency situations through the Panther Alert System. Students are encouraged to sign up for Panther Alert Notifications by logging into their student accounts through the PCCC website at www.pccc.edu and following Panther Alert System instructions.

Notification for Students with Learnings Disabilities:

If you have a disability, and believe you need accommodations in this class, please contact the Office of Accessibility Services at 973-684-6395, or email ods@pccc.edu. You should do so as soon as possible at the start of each semester. If you require testing accommodations, you must remind me (the instructor) one week in advance of each test.