

COMS-218: DISCRETE STRUCTURES

Effective Term

Fall 2021

BOT Approval

03/11/2021

SECTION A - Course Data Elements

CB04 Credit Status

Credit - Degree Applicable

Discipline

Minimum Qualifications	And/Or
Computer Science (Master's Degree)	Or
Mathematics (Master's Degree)	

Subject Code

COMS - Computer Studies

Course Number

218

Department

Computer Studies

Division

Career Education and Workforce Development (CEWD)

Full Course Title

Discrete Structures

Short Title

Discrete Structures

CB03 TOP Code

0706.00 - Computer Science (Transfer)

CB08 Basic Skills Status

NBS - Not Basic Skills

CB09 SAM Code

E - Non-Occupational

Rationale

Discrete Math is a required course in the Computer Science ADT.

SECTION B - Course Description

Catalog Course Description

This course will introduce the discrete structures used in Computer Science, with an emphasis on their applications. Topics covered include: Functions, Relations and Sets; Basic Logic; Proof Techniques; Basics of Counting; Graphs and Trees; and Discrete Probability.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit

No

Repeatability

Not Repeatable

Grading Options

Letter Grade or Pass/No Pass

Allow Audit

Yes

Requisites**Prerequisite(s)**

Completion of COMS-215 with a minimum grade of C.

Advisory Prerequisite(s)

Completion of MATH-108 with a minimum grade of C.

Requisite Justification**Requisite Description**

Course Not in a Sequence

Subject

COMS

Course #

215

Level of Scrutiny

Content Review

Upon entering this course, students should be able to:

Completion of COMS-125 with a minimum grade of C.

SECTION D - Course Standards**Is this course variable unit?**

No

Units

3.00

Lecture Hours

54.00

Outside of Class Hours

108

Total Contact Hours

54

Total Student Hours

162

Distance Education Approval**Is this course offered through Distance Education?**

Yes

Online Delivery Methods

DE Modalities	Permanent or Emergency Only?
Entirely Online	Permanent
Hybrid	Permanent
Online with Proctored Exams	Permanent

SECTION E - Course Content**Student Learning Outcomes**

Upon satisfactory completion of the course, students will be able to:	
1.	Explain the relationship between mathematical induction and recursion/recurrence equations, and their relationship to computing systems.

Course Objectives

Upon satisfactory completion of the course, students will be able to:	
1.	Describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms.
2.	Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
3.	Demonstrate different traversal methods for trees and graphs.
4.	Analyze a problem to create relevant recurrence equations.
5.	Relate the ideas of mathematical induction to recursion and recursively defined structures.

Course Content

1. Functions, Relations and Sets
 - a. Functions (surjections, injections, inverses, composition)
 - b. Relations (reflexivity, symmetry, transitivity, equivalence relations)
 - c. Sets (Venn diagrams, complements, Cartesian products, power sets)
 - d. Pigeonhole principles
 - e. Cardinality and countability
2. Basic Logic
 - a. Propositional logic
 - b. Logical connectives
 - c. Truth tables
 - d. Normal forms (conjunctive and disjunctive)
 - e. Validity
 - f. Predicate logic
 - g. Universal and existential quantification
 - h. Modus ponens and modus tollens
 - i. Limitations of predicate logic
3. Proof Techniques
 - a. Notions of implication, converse, inverse, contrapositive, negation, and contradiction
 - b. The structure of mathematical proofs
 - c. Direct proofs
 - d. Proof by counterexample
 - e. Proof by contradiction
 - f. Mathematical induction
 - g. Strong induction
 - h. Recursive mathematical definitions
 - i. Well orderings
4. Basics of Counting
 - a. Counting arguments
 - b. Sum and product rule
 - c. Inclusion-exclusion principle
 - d. Arithmetic and geometric progressions
 - e. Fibonacci numbers
 - f. The pigeonhole principle

- g. Permutations and combinations
- h. Basic definitions
- i. Pascal's identity
- j. The binomial theorem
- k. Solving recurrence relations
- l. Common examples
- m. The Master theorem
- 5. Graphs and Trees
 - a. Trees
 - b. Undirected graphs
 - c. Directed graphs
 - d. Spanning trees/forests
 - e. Traversal strategies
- 6. Discrete Probability
 - a. Finite probability space, probability measure, events
 - b. Conditional probability, independence, Bayes' theorem
 - c. Integer random variables, expectation
 - d. Law of large numbers

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Activity	The student will analyze a problem to create relevant recurrence equations.
Lecture	The instructor will teach the student how to relate the ideas of mathematical induction to recursion and recursively defined structures.
Other	Projects

Online Adaptation

Types	Examples of learning activities
Activity	
Directed Study	
Discussion	
Group Work	
Individualized Instruction	
Journal	
Lecture	

Instructor-Initiated Online Contact Types

Announcements/Bulletin Boards
 Chat Rooms
 Discussion Boards
 E-mail Communication
 Telephone Conversations
 Video or Teleconferencing

Student-Initiated Online Contact Types

Chat Rooms
 Discussions
 Group Work

Course design is accessible

Yes

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Exams/Tests	Final Exam - In the final exam, the student will apply the binomial theorem to independent events and Bayes' theorem to dependent events.
Quizzes	The student will be quizzed on the different traversal methods for trees and graphs.
Homework	Students will describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms.

Assignments

Reading Assignments

Read Section 9.4 on the Pigeonhole Principle.

Writing Assignments

For Section 4.2 on Direct Proof and Counterexample: Divisibility, complete problems 1-31.

SECTION F - Textbooks and Instructional Materials

Material Type

Textbook

Author

Epp, Susanna

Title

Discrete Mathematics with Applications

Edition/Version

5th

Publisher

Cengage

Year

2019

SECTION G - Diversity, Equity and Inclusivity

Course Codes (Admin Only)

CB10 Cooperative Work Experience Status

N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status

Y - Credit Course

CB13 Special Class Status

N - The Course is Not an Approved Special Class

CB23 Funding Agency Category

Y - Not Applicable (Funding Not Used)

CB24 Program Course Status

Program Applicable

Allow Pass/No Pass

Yes

Only Pass/No Pass

No