

# MA2509: DISCRETE MATHEMATICS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Discrete Mathematics

### Subject Code

MA - Mathematics

### Course Number

2509

### Academic Unit

Mathematics (MA)

### College/School

College of Science (SI)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

MA2185 Discrete Mathematics

MA2504 Discrete Mathematics

## Part II Course Details

### Abstract

This course introduces the basic concepts and techniques of discrete mathematics. It will help students understand the basic theory and recognize the applications of discrete mathematics. It trains students in the ability to think quantitatively and analyze problems critically.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain at high levels concepts and implement basic operations in discrete mathematics.	x	x	
2	perform combinatorial analysis to solve counting problems.		x	
3	design and formulate mathematical models through relations, combinatorics, graphs, and trees.	x	x	
4	apply mathematical reasoning to comprehend and construct mathematical arguments.		x	
5	apply graph theory and other mathematical methods to both data structures and analysis of algorithms, and some other problems in computer sciences.		x	x

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Learning through teaching is primarily based on lectures.	1, 2, 3, 4, 5	40 hours in total
2	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	1	4 hours
3	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	2	2 hours

4	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	3	2 hours
5	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	4	1 hour
6	Tutorials	Learning through tutorials is primarily based on interactive problem solving allowing instant feedback.	5	3 hours
7	Assignments	Learning through take-home assignments helps students understand basic concepts and techniques of discrete mathematics, and apply mathematical methods and analysis from discrete mathematics to some applications in computer sciences.	1, 2, 3, 4, 5	after-class
8	Online applications	Learning through online examples for applications helps students create and formulate simple mathematical models and apply to some problems in computer sciences.	3, 5	after-class
9	Math Help Centre	Learning activities in Math Help Centre provides students extra help.	1, 2, 3, 4	after-class

**Assessment Tasks / Activities (ATs)**

	<b>ATs</b>	<b>CILO No.</b>	<b>Weighting (%)</b>	<b>Remarks</b>
1	Quiz	1, 2	10	Questions are designed for the first part of the course to see how well the students have learned the basic concepts.
2	Test	2, 3	20	Questions are designed for the second part of the course to see how well the students have learned the basic techniques and recognize the applications of discrete mathematics.

3	Hand-in assignments	1, 2, 3, 4, 5	5	These are skills-based assessment to enable students to demonstrate the basic concepts, techniques of discrete mathematics and identify the applications.
4	Formative take-home assignments	1, 2, 3, 4, 5	5	The assignments provide students chances to demonstrate their achievements on discrete mathematics learned in this course.

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

3

**Additional Information for ATs**

40% Coursework

60% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

**Assessment Rubrics (AR)****Assessment Task**

1. Test/ Quizzes

**Criterion**

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

**Excellent (A+, A, A-)**

Correctly answer most of the questions

**Good (B+, B, B-)**

Correctly answer majority of the questions

**Fair (C+, C, C-)**

Correctly answer more than 40% of the questions

**Marginal (D)**

Correctly answer more than 30% of the questions

**Failure (F)**

Not even reaching marginal levels

**Assessment Task**

2. Hand-in assignments

**Criterion**

ABILITY to UNDERSTAND course materials and APPLY them on the posed QUESTIONS

**Excellent (A+, A, A-)**

Correctly answer almost all questions

**Good (B+, B, B-)**

Correctly answer most of the questions

**Fair (C+, C, C-)**

Correctly answer majority of the questions

**Marginal (D)**

Attempt on majority of the questions

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

3. Formative take-home assignments

**Criterion**

ABILITY to UNDERSTAND course materials and FULLY APPLY them on the posed QUESTIONS

**Excellent (A+, A, A-)**

Correctly answer almost all questions

**Good (B+, B, B-)**

Correctly answer most of the questions

**Fair (C+, C, C-)**

Correctly answer majority of the questions

**Marginal (D)**

Attempt on majority of the questions

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

4. Examination

**Criterion**

ABILITY to SOLVE in DETAIL and with ACCURACY the posed QUESTIONS

**Excellent (A+, A, A-)**

Correctly answer most of the questions

**Good (B+, B, B-)**

Correctly answer majority of the questions

**Fair (C+, C, C-)**

Correctly answer more than 40% of the questions

**Marginal (D)**

Correctly answer more than 30% of the questions

**Failure (F)**

Not even reaching marginal levels

## Part III Other Information

**Keyword Syllabus**

Propositional Logic. Predicate Logic. Sets. Functions. Relations. Equivalence & Order Relations. Combinatorics. Inclusion-Exclusion Principle. Recurrence Relations. Graphs. Directed Graphs. Connectivity. Euler & Hamilton Graphs. Weighted Graphs. Shortest Paths (Dijkstra's Algorithm), Trees. Rooted Trees. Binary Trees. Spanning Trees.

**Reading List****Compulsory Readings**

Title	
1	K. H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, McGraw Hill, 2012

**Additional Readings**

Title	
1	Nil