# MA2185: DISCRETE MATHEMATICS

**Effective Term**
Semester A 2022/23

## Part I Course Overview

**Course Title**
Discrete Mathematics

**Subject Code**
MA - Mathematics
**Course Number**
2185

**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**
MA2144 Discrete Mathematics
MA2504 Discrete Mathematics
MA2509 Discrete Mathematics

# Part II Course Details

**Abstract**

This course aims to introduce basic ideas of discrete mathematics such as formal mathematical reasoning techniques, basic counting techniques and their applications, number theory and graph theory for computer science students. The objective is intended for students to understand the basic theory and some applications of discrete mathematics. The course gives students training in the ability to think quantitatively and analyse problems critically.

**Course Intended Learning Outcomes (CILOs)**

| | CILOs | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|---|---|---|---|---|---|
| 1 | explain at high levels concepts from discrete mathematics. | | x | | |
| 2 | implement basic operations in discrete mathematics. | | | x | |
| 3 | use formal mathematical reasoning techniques and basic counting techniques. | | | x | |
| 4 | develop mathematical models through relations,combinatorics, graph theory, and apply mathematical methods to a range of problems in computer sciences. | | x | x | |
| 5 | the combination of CILOs 1-4 | | 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 real-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. | 2 | 4 hours |
| 3 | Tutorials | Learning through tutorials is primarily based on interactive problem solving allowing instant feedback. | 3 | 4 hours |

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

**Assessment Tasks / Activities (ATs)**

| | **ATs** | **CILO No.** | **Weighting (%)** | **Remarks (e.g. Parameter for GenAI use)** |
|---|---|---|---|---|
| 1 | Test | 2, 3 | 15 | Questions are designed for the first part of the course to see how well the students have learned the basic concepts, techniques and some applications of discrete mathematics. |
| 2 | Hand-in assignments | 1, 2, 3, 4 | 15 | These are skills based assessment to see whether the students are familiar with the basic concepts, techniques of discrete mathematics and some applications in computer sciences. |

| | | | | |
|---|---|---|---|---|
| 3 | Formative take-home assignments | 5 | 0 | The assignments provide students chances to demonstrate their achievements on discrete mathematics learned in this course. |

**Continuous Assessment (%)**

30

**Examination (%)**

70

**Examination Duration (Hours)**

2

**Additional Information for ATs**

30% Coursework
70% Examination (Duration: 2 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

**Criterion**

ABILITY to SOLVE in DETAIL and withACCURACY the posed QUESTIONS

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

High

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

Significant

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

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

2. Hand-in assignments

**Criterion**

ABILITY to SOLVE in DETAIL and withACCURACY the posed QUESTIONS

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

High

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

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

**Marginal (D)**
Basic

**Failure (F)**
Not even reaching marginal levels

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**Assessment Task**
3. Formative take-home assignments

**Criterion**
ABILITY to SOLVE in DETAIL and withACCURACY the posed QUESTIONS

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

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

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

**Marginal (D)**
Basic

**Failure (F)**
Not even reaching marginal levels

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**Assessment Task**
4. Examination

**Criterion**
ABILITY to SOLVE in DETAIL and withACCURACY the posed QUESTIONS

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

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

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

**Marginal (D)**
Basic

**Failure (F)**

Not even reaching marginal levels

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# Part III Other Information

**Keyword Syllabus**

- Basic Concepts: Logic. Proof and mathematical reasoning. Recurrence relation. Sets and relations and functions. Cartesian product.
- Counting and Probability: Counting techniques. Permutations and combinations. Probability, random variables, expectation, and variance.
- Number Theory: Introduction to crypto, modulus operation, and finite group. Inverse and GCD.
- Graph Theory: Graph definition and properties. Euler and Hamiltonian circuits. Graph coloring. Planarity.

**Reading List**

**Compulsory Readings**

| | Title |
|---|---|
| 1 | Discrete Mathematics for Computer Science, by Kenneth P Bogart, Clifford Stein, and L. Drysdale (Key College Publishing, 2005) |

**Additional Readings**

| | Title |
|---|---|
| 1 | https://www.cityu.edu.hk/ma/programmes/undergraduate/non-BSCM-students/topics-recommended-readings-servicing-courses#heading14 |