The Hong Kong Polytechnic University

Subject Description Form

Subject Code	AMA2200
Subject Title	Discrete Mathematics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objective of the subject is to introduce students the basic ideas and techniques of discrete mathematics. The course aims to develop students' critical thinking, problem-solving, and mathematical reasoning skills, which are essential for mathematical and computer science and related disciplines.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Understand and apply basic concepts and terminology of discrete mathematics. (b) Develop logical reasoning skills and apply them to read, comprehend, and construct mathematical arguments and proofs. (c) Apply combinatorial techniques to solve counting and probability problems. (d) Analyze and interpret relations and functions in mathematical and computer science contexts. (e) Understand the fundamental concepts of graph theory and their applications.
Subject Synopsis/ Indicative Syllabus	<u>Sets and logic</u> Introduction to sets and set operations; Cartesian product and relations; Propositional logic and truth tables; Logical equivalences and laws of logic; Predicate logic and quantifiers <u>Proof techniques</u> Direct proof and proof by contrapositive; Proof by contradiction and mathematical induction; Proof by cases and proof by exhaustion; Disproof techniques <u>Combinatorics</u> Basic counting principles: permutations and combinations; Binomial coefficients and Pascal's triangle; Inclusion-exclusion principle; Pigeonhole principle and its applications; Recurrence relations and generating functions <u>Relations and Functions</u>

<table>
<tr><td></td><td>Relations and their properties; Equivalence relations and partial orders; Functions: injective, surjective, and bijective; Composition and inverse functions; Cardinality and countability

<u>Graph Theory</u>

Introduction to graphs and their representations; Graph terminology and basic properties; Paths, cycles, and connectivity; Trees and spanning trees; Graph coloring and planarity</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>This course will utilize lectures, tutorials, and learning activities to educate students on discrete mathematics. Lectures will serve as an introduction to the fundamental concepts, while tutorials will provide additional guidance and support. Through various learning activities, students will reinforce their understanding of the concepts and develop critical thinking skills. The course will also encourage self-directed learning, and assessment will be conducted through homework assignments/quizzes, tests and exams.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Assignments/ Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Midterm test(s)</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="5"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The subject focuses on knowledge, skill and understanding of Discrete Mathematics, thus, Exam-based assessment is the most appropriate assessment method, including 20% test and 60% examination. Moreover, 20% worth of assignments/in-class quizzes are included as a component of continuous assessment so as to keep the students in progress.

Continuous Assessment comprises of assignments/quizzes and tests. A written examination is held at the end of the semester.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>Tutorials</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
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</table>

	▪ Assignments	15 Hrs.
	▪ Self-study	55 Hrs.
	Total student study effort	109 Hrs.
Reading List and References	Textbook: Rosen, K. H. (2019). Discrete Mathematics and Its Applications (8th ed.). McGraw-Hill Education. Reference books: Epp, S. S. (2019). Discrete Mathematics with Applications. Cengage Learning. Johnsonbaugh, R. (2018). Discrete Mathematics. Pearson. Grimaldi, R. P. (2017). Discrete and Combinatorial Mathematics: An Applied Introduction. Pearson. Dossey, J. A., Otto, A., Spence, L., & Vanden Eynden, C. (2018). Discrete Mathematics (5th ed.). Pearson.	