[Course Title] Discrete Mathematical Tools for Computer Science

[Course Code] COMP2711

[No. of Credits] 4

[Any pre-/co-requisites] Prerequisite(s): A passing grade in AL Pure Mathematics/AL Applied Mathematics; OR level 3 or above in HKDSE Mathematics Extended Module M1/M2; Corequisite(s): (For students without prerequisites) MATH 1012 OR MATH 1013 OR MATH 1014 OR MATH 1020 OR MATH 1023 OR MATH 1024; Exclusion(s): COMP 2711H, MATH 2343

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Course Description

Basic concepts in discrete mathematics needed for the study of computer science: enumeration techniques, basic number theory, logic and proofs, recursion and recurrences, probability theory and graph theory. The approach of this course is specifically computer science application oriented.

Intended Learning Outcomes (ILOs)

On successful completion of this course, students are expected to be able to:

ILO1: Understand and use the specific mathematical concepts taught

ILO2: Understand and use basic mathematical proof techniques. In particular they will be able to prove new statements not previously taught in class

ILO3: Model simple combinatorial and computational problems mathematically

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assessment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)
In-Class Quizzes	10%
Homework	20%
Midterm Exam	30%
Final Examination	40%

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
In-Class Quizzes	ILO1	Quizzes assess students' understanding of specific mathematical concepts taught in class, such as enumeration techniques, number theory, logic, probability, and graph theory.
Homework	ILO1, ILO2, ILO3	Homework tasks require students to apply mathematical concepts (ILO1) and practice basic proof techniques, including proving new statements not directly taught (ILO2), as well as problem modelling (ILO3).
Exams	ILO1, ILO2, ILO3	The exams comprehensively evaluates understanding of all taught concepts (ILO1), proficiency in proof techniques including new statements (ILO2), and problem modelling (ILO3).

Grading Rubrics

Criteria for evaluation	Quizzes, homework, and exams
Exemplary	Demonstrates a thorough and accurate understanding of all mathematical concepts (ILO1). Constructs clear, logical, and original proofs for both taught and new statements with no errors (ILO2). Models combinatorial and computational problems with exceptional clarity, precision, and creativity (ILO3). Solutions are well-organized, concise, and exceed expectations in depth and insight.
Competent	Shows a solid understanding of most mathematical concepts with minor errors or omissions (ILO1). Applies basic proof techniques effectively, with mostly correct proofs for new statements (ILO2). Models problems mathematically with reasonable accuracy and clarity, though minor refinements may be needed (ILO3). Solutions are clear, logical, and meet expectations.
Needs work	Displays partial understanding of mathematical concepts, with noticeable gaps or errors (ILO1). Struggles to apply proof techniques consistently; proofs for new statements are incomplete or flawed (ILO2). Attempts to model problems but with significant inaccuracies or lack of clarity (ILO3). Solutions are somewhat disorganized or lack sufficient detail.
Unsatisfactory	Lacks understanding of key mathematical concepts, with frequent and major errors (ILO1). Fails to apply proof techniques effectively; unable to prove new statements (ILO2). Unable to model problems mathematically or models are entirely incorrect (ILO3). Solutions are incomplete, illogical, or severely disorganized.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Exhibits exemplary mastery of all mathematical concepts taught, with consistent accuracy and depth (ILO1). Demonstrates advanced proficiency in proof techniques, successfully proving new statements with clarity and originality (ILO2). Models combinatorial and computational problems with exceptional precision and insight (ILO3).
B	Good Performance	Shows a strong understanding of most mathematical concepts, with minor errors or occasional lapses (ILO1). Applies proof techniques effectively, constructing mostly correct proofs for new statements (ILO2). Models problems accurately, though with room for refinement in clarity or creativity (ILO3).
C	Satisfactory Performance	Demonstrates a basic understanding of key mathematical concepts, but with noticeable gaps or inconsistencies (ILO1). Applies proof techniques with partial success; struggles with proving new statements independently (ILO2). Models problems with moderate success, though solutions may lack precision or completeness (ILO3).
D	Marginal Pass	Displays limited understanding of mathematical concepts, with frequent errors or significant gaps (ILO1). Struggles significantly with proof techniques, rarely producing correct or complete proofs for new statements (ILO2). Attempts to model problems but with major inaccuracies or incomplete approaches (ILO3).
F	Fail	Fails to demonstrate understanding of core mathematical concepts, with pervasive errors (ILO1). Unable to apply proof techniques effectively or prove new statements (ILO2). Unable to model problems mathematically or produces entirely incorrect solutions (ILO3).

Course AI Policy

The use of generative AI tools (such as ChatGPT) are prohibited in this class including all assignments.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include sample solutions. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

N/A

Required Texts and Materials

Discrete Mathematics and its Applications. Kenneth H. Rosen, 7th or 8th Edition, McGraw-Hill.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Additional Resources

N/A