Course Code   Course Title
COMP 2711H   **Honors Discrete Mathematical Tools for Computer Science**

Course Description

Discrete mathematics needed for the study of computer science: sets, functions; propositional logic, predicate logic, rules of inference, proof techniques; pigeonhole principle, basic and generalized permutations and combinations, binomial coefficients, inclusion-exclusion principle; probability theory, Bayes theorem, expectation, variance, random variables, hashing; cryptography and modular arithmetic, Euclid's division theorem, multiplicative inverse, divisibility, RSA cryptosystem, Chinese remainder theorem; mathematical induction, strong induction and well-ordering property, recursion, recurrence relations; graph representation, isomorphism, connectivity, Euler paths, Hamilton paths, planarity, graph coloring. Gentle introduction to many discrete mathematical concepts that will appear later in more advanced computer science courses. Prerequisite(s): Grade B or above in AL Pure Mathematics/AL Applied Mathematics; OR level 5* or above in HKDSE Mathematics Extended Module M1/M2; OR grade A- or above in MATH 1014; OR grade B+ or above in MATH 1020 / MATH 1024. Exclusion(s): COMP 2711, MATH 2343

List of Topics

Topics	Lectures
Logic	Propositional logic
	Predicate logic
	Inference and proofs
Review of basics	Sets and functions
Number theory	Modular arithmetic
	GCDs and congruences
	Cryptography
Counting	Basic counting
	Permutations and combinations
	Binomial coefficients
	Inclusion-exclusion
	Analysis of algorithms
Probability	Introduction to probability
	Conditional probability
	Expectation and variance
Induction and recursion	Induction
	Recursion

Graphs	Graphs
Review	Final review

Textbooks

N/A

Reference books

- Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw-Hill
- C. Stein, R.L. Drysdale and K. Bogart, Discrete Mathematics for Computer Scientists, International Edition, Pearson, 2011

Grading Scheme

Assignments	10%
Midterm	40%
Final	50%
Total	100%

Course Intended Learning Outcomes

- Understand the formulation of common problems in several areas of discrete mathematics, including combinatorics, number theory and cryptography, logic and proof, recursion and recurrences and probability theory.
- Understand the connection between the discrete mathematical tools learned and some core computer science topics covered later in the curriculum, including computational complexity, information security, recursive functions and data structures.
- Apply the mathematical techniques learned to solve problems in a range of topics.
- Demonstrate a level of mathematical maturity by solving problems using an array of proof techniques.

Assessment Rubrics
N/A