MATHEMATICS 273
"HONOURS MATHEMATICS: NUMBERS AND PROOFS"

Calendar Description: H(3-1T-1)

Introduction to proofs. Functions, sets and relations. The integers: Euclidean division algorithm and prime factorization; induction and recursion; integers mod n. Real number: sequences of real numbers; completeness of the real numbers; open and closed sets. Complex numbers.

Prerequisite: A grade of 70% or higher in Pure Mathematics 30 or equivalent.

Suggested Text: "An Introduction to Mathematical Thinking", Gilbert and Vanstone.

Syllabus

Topics	Number of Hours
(1) Sets and Functions:	
- functions, domain, codomain	1
- The graph of a function	1
- Composition of functions, injections, surjection	1
(2) Integers:	
- Division algorithm, Euclidean algorithm	2
- Prime numbers, prime factorization	2
- Equivalence relations, modular arithmetic	4
- Induction, recursion	2
- The Binomial Theorem	2
(3) Rational Numbers:	
- Defined via equivalence relations	1
(4) Real Numbers:	
- Limits (e.g. Rogawski, S2.8)	2
- Sequence (e.g. Rogawski S11.1)	3
- Real numbers defined as equivalence classes of Cauchy sequences of real numbers	optional
- Completeness of the real numbers, upper bounda, Bolzano-Weierstrass theorem (e.g. Rogawski, App B or Rudin, Ch 1)	3
- Norms (e.g. Rudin, Ch 2)	1
- Topology of the real line: open and closed sets, etc. (e.g. Rogawski or Rudin, Ch 2)	1
- Base-p expansions	optional
(5) Complex Numbers:	
- Quadratic equations	1
- Addition, multiplication and division of complex number	1
- The complex plane	1
- Properties of complex numbers	1
- Polar representation and De Moivre's	1
- Roots of complex numbers	2
- The fundamental theorem of algebra	optional
TOTAL HOURS	**33**

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