INSTITUTE OF MATHEMATICS
College of Science
University of the Philippines Diliman

**Math 108 Course Syllabus**

## A. Course Catalogue Description

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|---|---|
| Course Number | Math 108 |
| Course Title | Foundations of Abstract Mathematics |
| Course Description | Propositional and predicate calculus; methods of proof; algebra of sets; relations and functions; finite and infinite sets |
| Prerequisite | Math 21/equiv. or COI |
| Course Credit | 4 units |
| Number of Hours | 4 hours/week |

## B. Course Content

I. Course Introduction

II. Propositional Calculus
   1. Propositions and Logical Connectives
   2. Truth Tables
   3. Tautology, Contradiction and Contingency
   4. Equivalent Statements
   5. Arguments and Valid Deductions

III. Set Equality, Inclusion, Membership

IV. Predicate Calculus
   1. Truth Set and Universe of Discourse
   2. Universal and Existential Quantifiers
   3. Valid Deductions

V. Basic Proof Methods
   1. Proofs of Complex Propositions and Quantified Predicates
   2. Epsilon-N Proofs of Convergence of Sequences
   3. Principle of Mathematical Induction

VI. Algebra of Sets
   1. Russell's Paradox and Axiom of Separation
   2. Set Operations and Related Proofs

VII. Relations
   1. Domain, Range, Inverse and Composition
   2. Reflexive, Symmetric, Transitive, and Antisymmetric Relations
   3. Order Relations, Partial and Total Orders
   4. Hausdorff Maximality Principle
   5. Supremum and Infimum of Subsets of Real Numbers
   6. Equivalence Relations; Congruence Modulo m
   7. Equivalence Classes and Partitions

VIII. Functions
   1. Restriction and Extension
   2. Injection, Surjection, and Bijection
   3. Inverse and Composition of Functions
   4. Image and Inverse Image of a Set
   5. Properties of Images and Inverse Images of Union and Intersection of Sets

6. Permutations on Finite Sets

IX. Finite and Infinite Sets

1. Equivalence of Sets
2. Cardinality of Finite Sets
3. Formulas for the Cardinality of a Union, Intersection, and Power Set
4. Infinite Sets and Aleph Null
5. Countable and Uncountable Sets
6. Partial Order ("Dominated by") on Sets
7. Schröder-Berstein Theorem and Cantor's Theorem
8. Continuum Hypothesis
9. Countability of Rationals and Uncountability of Real Numbers
10. Countability of the Union and Cartesian Product of Sets

For a more detailed syllabus, send an email request to ddapr@math.upd.edu.ph.