

Syllabus

**Math 01.340 - Modern Algebra I**

**CATALOG DESCRIPTION:**

**Math 01.340 Modern Algebra I, 3 s.h.**

Prerequisites: Math 03.150 (Discrete Mathematics), Math 01.210 (Linear Algebra) and Phil 09.130 (Introduction to Symbolic Logic) with a C- or better in all the three courses

Modern Algebra studies sets with operations, referred to as algebraic systems. It has its roots directly in the oldest part of mathematics: natural numbers together with addition and multiplication. Even to this day natural numbers and integers remain a source of insightful examples for the instruction in the subject. This course includes: the introductory theory of groups, rings, integral domains, and fields. Also included are homomorphisms and isomorphisms, subgroups, kernels, rings and ideals, and polynomial rings. At the option of the instructor, computer use can be required.

**OBJECTIVES:**

This course is designed to develop students' knowledge in the area of abstract algebra and also their ability in mathematical reasoning.

**CONTENT:**

**1. Introduction**

- 1.1 Logic, sets, relations, functions
- 1.2 Equivalence relations, equivalence classes

**2. Groups**

- 2.1 Definition and examples
- 2.2 Basic group theorems
- 2.3 Cyclic groups
- 2.4 Subgroups, normal subgroups
- 2.5 Quotient groups
- 2.6 Homomorphisms, isomorphisms
- 2.7 Internal and External Direct Products

**3. Rings**

- 3.1 Definition and examples
- 3.2 Ring theorems
- 3.3 Homomorphisms
- 3.4 Ideals

3.5 Integral Domains, Division Rings, Fields

3.6 Polynomials

#### **4. Integral Domains**

4.1 Definition and examples

4.2 Ordered integral domains

4.3 Congruence and residue domains

#### **TEXTS:**

Rotman, J.J., A FIRST COURSE IN ABSTRACT ALGEBRA, 2nd ed, Prentice

Hall Pinter, C.C., A BOOK OF ABSTRACT ALGEBRA, 2nd ed, Dover, 1990

Herstein, I.N., TOPICS IN ALGEBRA, 2<sup>nd</sup> ed., Xerox, Mass., 1975.

Herstein, I.N. and Kaplansky, I., MATTERS MATHEMATICAL, Harper and Row, NY, 1974.

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