(3-0-1; —) **Algebraic Structures with Applications** MATH-217*

This is a required course in the second year of the Mathematics and Engineering curriculum. The purpose of the course is to provide an introduction to abstract algebraic systems, and to illustrate the concepts with applications to communication engineering.

Textbook: *Numbers, Groups and Codes*
by J. F. Humphreys and M. Y. Prest (Cambridge University Press)
Class Notes

Prerequisite: APSC-174*.

Instructor: R. Beheshti-Zavareh

Evaluation:		
	Final Examination	55%
	Midterm Examination	25%
	Homework	20%

Topics:

1. Symbolic logic: truth-functional operations, connectives, truth tables, tautologies and contradictions, logical implication and logical equivalence, valid arguments, methods of proof.
2. Set theory and mappings.
3. Equivalence relations.
4. The integers: mathematical induction, the division algorithm, greatest common divisors, primes and unique factorization theorem, congruence classes.
5. Group theory: groups, subgroups, cyclic groups, cosets and Lagrange's theorem, quotient groups, homomorphisms and isomorphisms.
6. Applications to error-control codes: binary block codes for noisy communication channels, Hamming distance, nearest neighbor decoding, code error detection/correction capabilities, group (linear) codes, coset decoding, generator and parity check matrices, syndrome decoding.
7. Polynomials.