

MATH 551 Abstract Algebra

1. DESCRIPTION

Basic definitions of rings and modules, Homomorphisms, Sums and products, Exactness, Hom and tensor, Adjoint isomorphism, Free, projective and injective modules. Chain conditions, Primary decomposition, Noetherian rings and modules, Artinian rings, structure theorem.

PREREQUISITE: MATH 345. MATH 450 IS RECOMMENDED

2. TEXTBOOK

ALGEBRA, by Serge LANG, Revised Third Edition

3. SYLLABUS

Week	Section	Material	Main
1	II.1	Rings and homomorphisms	Definitions and Examples
	II.2	Commutative rings	2.1-2.2
2	II.3	Polynomial rings	pp. 97-103
	II.4	Localization	Examples 1-3, Ideals of $S^{-1}A$
3	III.1	Basic definitions of modules	pp. 117-120
	III.2	The group of homomorphisms	2.1-2.2
4	III.3	Direct products and sums of modules	pp. 127-132
	III.4	Free modules and projective modules	4.1-4.3, Equiv. of P_1 - P_4
5	III.7	Modules over principal rings	7.1-7.3
6	III.9	The snake lemma	9.1
7	XVI.1-2	Tensor products	2.1-2.4, 2.6-2.7
8	XX.4	Injective modules	Equiv. of I_1 - I_3 , 4.1
9	X.1	Noeth. rings and modules: basic criteria	1.1-1.6
10	X.2	Associated primes	2.4-2.11
11	X.3	Primary decomposition	3.3 -3.5
	IV.4	Hilbert's basis theorem	4.1
12	X.4	Nakayama's lemma	4.2-4.5
13	X.7	Artinian modules	7.1-7.5
14	XVII.2	Semisimplicity	Equiv. of SS1-SS3
	XVII.4	Semisimple rings	4.1-4.3
15	XVII. Ex	Structure results (Exercises 1-6, p. 661)	Exercises 1-6, p. 661

4. GRADING POLICY

Take-home Exam 1	II.1 – III.9	100
Take-home Exam 2	XVI.1 – XVII.Ex	100