King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

Comprehensive Exam Syllabus

MATH 551: Abstract Algebra

MATH 551   Abstract Algebra

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 theorems.

Main References:

- P. Grillet, Abstract Algebra, 2nd edition, Graduate Text in Mathematics 242, Springer (2007).

https://link.springer.com/book/10.1007/978-0-387-71568-1

- T. Hungerford, Algebra, Graduate Text in Mathematics 73, Springer (1974).

https://link.springer.com/book/10.1007/978-1-4612-6101-8

Syllabus

Topic	Grillet's Book	Hungerford's Book
Rings, Homomorphisms, Ideals	III.1, III.2, III.3	III.1, III.2
Modules, Exact Sequences, Sums and Products	VIII.1, VIII.2, VIII.3, X.1	IV.1
Hom and Tensor, Adjoint Isomorphism, Flat Modules	XI.1, XI.2, XI.5, XI.6, XI.8	IV.4, IV.5
Free Modules, Vector Spaces	VIII.4, VIII.5	IV.2
Projective and Injective Modules	X.3, X.4	IV.3
Chain Conditions	VIII.8	VIII.1
Prime and Primary Ideals, Primary Decomposition	III.4, VII.1	VIII.2, VIII.3
Noetherian Rings and Modules	III.11, VIII.8	VIII.4
Simple and Semisimple Modules	IX.1, IX.2	IX.1
The Jacobson Radical	IX.5	IX.2
Artinian Rings, Semisimple Rings, Structure Theorems	IX.3, IX.6	IX.3