

King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics

SYLLABUS (Math 555, Term 131)

Dr. Othman Echi

Course:	Math 555
Title:	COMMUTATIVE ALGEBRA
Textbook:	M. F. Atiyah & I. G. Macdonald, INTRODUCTION TO COMMUTATIVE ALGEBRA, Addison-Wesley, 1969 .
Catalogue Description	Basics of rings and ideals. Rings of fractions, integral dependence, valuation rings, discrete valuation rings, Dedekind domains, fractional ideals. Topologies and completions, filtrations, graded rings and modules. Dimension theory.

Grading Policy

Instructor: Dr. Othman Echi E-mail: echi@kfupm.edu.sa	Office: 5-201/4 Tel: 860-1802 Webpage: http://faculty.kfupm.edu.sa/MATH/echi/
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Grading Policy: Two Majors 25% each; Project (Oral + Written) 20%, Final 30%.
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EXAMS:

1. **Major Exam I:** tba
2. **Major Exam II:** tba
3. **Final Exam:** tba

Week	Material
1	RINGS & IDEALS. Prime and Maximal Ideals, Nilradical and Jacobson Radical, Operations on Ideals
2	Extension and Contraction
3	MODULES. Nakayama's Lemma, Exact Sequences
4	Tensor Products of Modules, Exactness
5	RINGS AND MODULES OF FRACTIONS. Local Properties, Extension & Contraction in Rings of Fractions
6	INTEGRAL DEPENDENCE AND VALUATIONS. Integral Dependence, Going-up and going-down Theorems
7	Valuation Rings, Hilbert's Nullstellensatz.
8	CHAIN CONDITIONS.
9	NOETHERIAN RINGS.
10	ARTINIAN RINGS.
11	DISCRETE VALUATION RINGS
12	DEDEKIND DOMAINS
13- 14- 15	TOPOLOGIES COMPLETIONS DIMENSION THEORY