

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 552 (FIELDS AND GALOIS THEORY)

SEMESTER 071 (FALL 2007)

DR. JAWAD ABUIHLAIL

1. DESCRIPTION: *Field Extensions; The Fundamental Theorem; Splitting Fields and Algebraic Closure; Finite Fields; Separability; Cyclic, Cyclotomic, and Radical Extensions; Structure of Fields: Transcendence Bases.*

2. PREREQUISITE: Math 345 (Math 450 is recommended)

3. TEXTBOOK: Hungerford, T., *Algebra*, Graduate Texts in Mathematics 73, Springer-Verlag, New York-Berlin (1980).

4. FURTHER READING:

- 1) J. Rotman, *Galois theory*, Springer (1998).
- 2) I. Stewart, *Galois Theory*, 3rd edition, Chapman & Hall/CRC, Boca Raton, FL (2004).

5. GRADING POLICY:

Exam I (Take-home)	200
Exam II (Take-home)	200
Research Project	100

Detailed Syllabus

Section	Title	Week(s)	MATERIAL
I	Field Extensions	1 & 2	Finite & Infinite Dimensional Extensions, Algebraic & Transcendental Extensions, Ruler & Compass Constructions
II.	The Fundamental Theorem	3 & 4	Galois Extensions, Fundamental Theorem of Galois Theory, Symmetric Rational Functions
III.	Splitting Fields, Algebraic Closure and Normality	5 & 6	Splitting Field of a Polynomial, Algebraic Closure, Separable Polynomials, Separable Extensions, Generalized Fundamental Theorem, The Fundamental Theorem of Algebra
IV.	The Galois Group of a Polynomial	7 & 8	Galois Groups of Polynomials
V.	Finite Fields	9	Galois Fields, Prime Subfields
VI.	Separability	10 & 11	Purely Inseparable Elements, Purely Inseparable Extensions, Primitive Elements, Primitive Element Theorem
VII.	Cyclic Extensions	12 & 13	Cyclic & Abelian Extensions
VIII.	Cyclotomic Extensions	14	Cyclotomic Extensions & Cyclotomic Polynomials
IX.	Radical Extensions	15 & 16	Radical Extensions, Solvability by Radicals, General Equations of Order n