

## MATH 653 ADVANCED TOPICS IN COMMUTATIVE ALGEBRA

### 1. DESCRIPTION

Linear Topology and Completion, Krull rings, Dimension Theory, Hilbert Function and Samuel Function, Systems of Parameters and Multiplicity, Dimension of Extension Rings, Regular Rings, Auslander-Buchsbaum Theorem, Flatness and Fibers, Applications of Complete Local Rings: Ratliff's Theory of Universally Catenarian Rings.

### 2. TEXTBOOK

H. Matsumura, COMMUTATIVE RING THEORY, Cambridge Studies in Advanced Mathematics, Vol. 8, Cambridge University Press, Cambridge, 1989

### 3. SYLLABUS

WEEK	MATERIAL
-	Appendix 1: Direct and Inverse Limits
-	Appendix 2: Some Homological Algebra
1	<b>Properties of Extension Rings:</b> Completion and the Artin-Rees Lemma
2	Completion and the Artin-Rees Lemma (cont.)
3	<b>Krull Rings</b>
4	<b>Dimension Theory:</b> Graded Rings, Hilbert Function and Samuel Function
5	Graded Rings, Hilbert Function and Samuel Function (cont.)
6	Systems of Parameters and Multiplicity
7	Systems of Parameters and Multiplicity (cont.)
<b>Wed. March 29: Take-home Exam 1</b>	
8	Dimension of Extension Rings
9	Dimension of Extension Rings (cont.)
10	<b>Regular Rings:</b> Regular Rings
11	UFDs, Auslander-Buchsbaum Theorem
12	<b>Flatness (over Noetherian Rings):</b> Local Flatness Criterion
13	Flatness and Fibers
14	<b>Ratliff's Theory of Universally Catenarian Rings</b>
15	Ratliff's Theory of Universally Catenarian Rings (cont.)
<b>Wed. May 17: Take-home Exam 2</b>	

### 4. GRADING POLICY

Take-home Exam 1	Weeks 1-7	100
Take-home Exam 2	Weeks 8-15	100
Presentations	-	100