KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 654 (ADVANCED TOPICS IN ALGEBRA)
TILTING AND COTILTING MODULES OVER COMMUTATIVE RINGS
FALL 2006 (SEM. 061)

DR. JAWAD ABUIHLAIL

DESCRIPTION: Regular Sequences, Cohen-Macaulay Rings, Gorenstein Rings, Divisible Modules, Morita Theory, *-Modules, Tilting Modules, Cotilting Modules.

MAIN REFERENCES:

MONOGRAPHS:

1) R. Colby and D. Fuller, *Equivalence and Duality for Module Categories: with Tilting and Cotilting for Rings*, Cambridge University Press (2004).
2) R. Göbel & J. Trlifaj, *Approximations and Endomorphism Algebras of Modules*, De Gruyter Expositions in Mathematics: Vol. 41 (2006).
3) E. Enochs & O. Jenda, *Relative Homological Algebra*, Gruyter Expositions in Mathematics: Vol. 30 (2000).
4) L. Fuchs & L. Salce, *Modules over Non-Noetherian Domains*, Mathematical Surveys and Monographs: Vol. 84. American Mathematical Society (2000).
5) H. Matsumura, *Commutative Ring Theory*. Cambridge University Press (2004).

ARTICLES:

[1] L. Angeleri Hügel, D. Herbera and J. Trlifaj, *Tilting modules and Gorenstein rings*, Forum Math. **18** (2006), 217-235.
[2] L. Angeleri Hügel, D. Herbera and J. Trlifaj, *Divisible modules and localization*, J. Algebra **294** (2005), 519-551.
[3] S. Bazzoni, Cotilting and tilting modules over Prüfer domains, *to appear in Forum Math.*
[4] L. Salce, *F-divisible modules and tilting modules over Prüfer domains*, J. Pure Appl. Algebra, **199** (2005), 245-259.
[5] L. Salce, *Tilting modules over valuation domain*, Forum Math. **16** (2004) 539-552.

SYLLABUS:

Week(s)	Material	Main Reference(s)
1	*Regular Sequences*	Matsumura (Section 16) Enochs & Jenda (Chapter 9)
2	*Cohen-Macaulay Rings*	Matsumura (Section 17) Enochs & Jenda (Chapter 9)
3-4	*Gorenstein Rings*	Matsumura (Section 18) Enochs & Jenda (Chapter 9)
5	*Some Module Theoretic Observations*	Colby & Fuller (Chapters 1)
6	*Representable Equivalences*	Colby & Fuller (Chapters 2)
7-8	*Classical 1-Tilting Modules*	Colby & Fuller (Chapters 3)
9	*n-Tilting modules*	Göbel & Trlifaj (Section 5.1)
10	*Tilting Torsion Classes*	Göbel & Trlifaj (Section 6.1)
11-13	*Tilting Modules over particular Domains*	Göbel & Trlifaj (Section 6.2) Salce (2005)
14	*Matlis Localizations*	Göbel & Trlifaj (Section 6.3)
15	*Cotilting Modules over Particular Domains (Brief Introduction)*	Göbel & Trlifaj (Chapter 8)
16	*Review and Discussion*	

GRADING POLICY:

Take-home Exam	**250 Points**
Research Project	**250 Points**