

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS  
**MECHANICAL ENGINEERING DEPARTMENT**

**ME 552: ADVANCED DYNAMICS**

**Second Semester 2005-2006 (052)**

**Catalog Description:**

Fundamentals of Newtonian dynamics. Hamilton's principle and Lagrange's equations. Relativistic dynamics. Central force motion, stability of circular orbit. Rigid body dynamics. Euler equations of motion, Euler angles, gyroscopic motion, spinning projectile, Hamilton's equations and phase space. Hamilton-Jacobi equation.

**Instructor:** Dr. M. Sunar, Office: 22-208, Tel: 4976, E-mail: [mehmets@kfupm.edu.sa](mailto:mehmets@kfupm.edu.sa)  
Office Hours: SMW 12:10-1:00 PM, UT 4:10-5:00 PM

**Textbook:** *Advanced Engineering Dynamics* by J. H. Ginsberg, Harper & Row.

**References:** 1) *Principles of Dynamics* by D. T. Greenwood, Prentice-Hall.  
2) *Methods of Analytical Dynamics* by L. Meirovitch, McGraw Hill.

**Outline of Lectures:**

- 1) Introduction
- 2) Particle Kinematics
- 3) Relative Motion
- 4) Kinematics of Rigid Bodies
- 5) Newtonian Kinetics of Rigid Bodies
- 6) Analytical Mechanics
- 7) Gyroscopic Motion

**Grading System:**

(25%) 1<sup>st</sup> Major Exam  
(25%) 2<sup>nd</sup> Major Exam  
(15%) Homework Assignments  
(35%) Final Exam

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(100%) Total