

# **Department of Chemistry Evening Program**

First Semester 2007-8

## MATH 401 (S): Mechanics and Geometry I

Activity	Dates	
Introduction day	July 16	Class Schedule
Teaching	July 17 – December 8	Friday 1735h – 1915h
Preparatory Leave for Examinations	December 9–12	Saturday 1735h - 1825h
Semester Examinations	December 13–31	Office Hours
Vacations	September 14 – October 13	Friday 1920h

Course Supervisor: Professor Dr. Syed Arif Kamal

Member AIAA (USA), IBRO (France)

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Homepage: http://ngds-ku.org/kamal

For course announcements, assignments and past papers, go to Pedagogical Section, click on

"Courses (offered during the current semester)"

e-mail: kamal(at the rate of)ngds-ku.org

Office: Room No. 6, Department of Mathematics, University of Karachi

*Directions*: http://www.ngds-ku.org/kamal/contact.htm#Directions

#### **Course Objectives**

To give the students sound background in the techniques & the methods of mechanics & geometry so that they can apply the ideas to different branches of science & engineering.

#### **Course Outline**

Section A – Vector Analysis: Differentiation & integration of vectors, scalar & vector fields, gradient, divergence & curl, line, surface & volume integrals, theorems of Green, Gauss & Stoke (without proofs), applications

Section B – Statics: Composition of forces, equilibrium problems, moments & couples, centers of mass & gravity, friction, virtual work, flexible cables, catenaries

Section C – Plane Curves: Curves in Cartesian plane, parametric representation, polar coördinates, tangent & normal, polar equation of a conic, pedal equations, change of axes, general equation of a second degree, extreme values, singular points, asymptotes, curve tracing, length of arc, intrinsic equation, curvature, area in rectangular & polar coördinates

Section D – Analytic Geometry in Three Dimensions: Direction cosines & direction ratios, equations of a line, angle between two lines, distance of a point from a line, shortest distance between two lines, equation of a plane, angle between planes, area of a triangle & volume of tetrahedron, spherical-polar & cylindrical coördinates, surfaces, intercepts, traces, symmetry, quadratic surfaces, sphere, surface of revolution, ruled surfaces

### **Recommended Reading**

- a) Anton H, Calculus: A New Horizon (6<sup>th</sup> edition), 1999, John Wiley, New York
- b) Marion JB, Classical Dynamics of Particles and Fields (2<sup>nd</sup> edition), 1970, Academic Press, New York
- c) Thomas GB, Finney AR, Calculus (10<sup>th</sup> edition), 2002, Addison-Wesley, Reading, Ma, USA
- d) Spiegel MR, Vector Analysis, Schaum Outline Series