University of Karachi

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