



کراچی یونیورسٹی

University of Karachi

Department of Mathematics

First Semester 2009

Prerequisite: MATH 510

MATH 685: Astronomy I (3+0)

Activity	Dates	Class Schedule
Introduction day	January 1	Room No. 7, Mathematics
Teaching	January 2 – May 9	Friday 0950h – 1109h
Mid-term	February 23 – March 7	Saturday 1025h – 1204h
Semester Examinations	May 11–30	Office Hours
Vacations	June 1 – July 15 (Summer)	Friday 1110h – 1149h

Course Supervisor: Professor Dr. Syed Arif Kamal Member AIAA (USA), IBRO (France)
MS (Indiana, Bloomington, USA), MA (Johns Hopkins, USA), PhD

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

Course Objectives

To give the students a sound background in the techniques and the methods of astrodynamics and space-light dynamics, so that they can see the applications of these ideas in different branches of science and engineering, *e. g.*, orbit computation for satellites and satellite-launch vehicles, stability consideration for launching of satellites, autopilot designing for spacecrafts and attitude control of satellites.

Higher Education and Job Opportunities

MS/PhD from Department of Mathematics or ISPA, MS from IST (Islamabad); jobs in SUPARCO, NDC, PAF & other R&D organizations

Course Outline

Section A: Orientation of earth, latitude, longitude, meridian, dateline international, poles, Greenwich mean time (GMT), time zones, rotation of earth about its axis, formation of day and night with demonstration, revolution of earth round the sun, tilting of earth axis, seasons, solar calendar, lunar calendar,

core, crust and atmosphere of earth, origin of earth magnetism, geographic and magnetic north poles, solar and lunar eclipses, solar system

Section B: Problem-solving techniques (scalar and vector methods: force and energy methods, conservation laws as applied in astronomy, under-determined, critically-determined and over-determined systems: existence of solution of pair of simultaneous equations), mathematics of scientific instruments, errors (systematic and random), spherical-polar and cylindrical coordinates

Section C: Gravitational mass and inertial mass, weak principle of equivalence, mass and weight, factors in modeling of 'g', expression for 'g' (inside and outside earth)

Section D: Parts of rocket, rocket and aircraft engines, astrodynamical terminologies and coordinate systems, convention to label axes, combination of rotations, Euler angles, infinitesimal transformations

Recommended Reading

- R. Deusch, *Orbital Dynamics of Space Vehicles*, Prentice Hall, Englewood Cliffs, New Jersey, USA (1963)
- M. Zeilik, *Conceptual Astronomy: A Journey of Ideas*, John Wiley, New York, USA (1993)

For course announcements, assignments and past papers, go to *Pedagogical Section*, click on "Courses (offered during the current semester)". This handout may be downloaded from:

<http://www.ngds-ku.org/M685-6/MATH685_09.pdf>