1302 (Applied Mathematics 2)

Year:	2009–2010
Code:	MATH1302
Old Code:	MATHM13B
Value:	Half unit (= 7.5 ECTS credits)
Term:	2
Structure:	3 hour lectures and 1 hour problem class per week. Weekly assessed coursework.
Assessment:	90% examination, 10% coursework
Normal Pre-requisites:	1301, 1401
Lecturer:	Dr M Dahl
Problem class teacher:	Dr R I Bowles

Course Description

This course follows the first term introduction to applied mathematics and gives a comprehensive coverage of Newtonian dynamics of point particles. The classic problem of a central force with the inverse square law is studied extensively. Particle collisions and systems with changing mass are considered. An introduction is given to the study of waves and oscillations.

Recommended Texts

Suggested textbooks are: (i) P Smith and R C Smith, *Mechanics* (2nd ed.), Wiley, (ii) C D Collinson, *Introductory Mechanics*, Arnold, (iii) M Lunn, *A first course in Mechanics*, OUP, (iv) C D Collinson and T Roper, *Particle Mechanics*, Arnold.

Detailed Syllabus

Particle motion with one degree of freedom: Serret-Frenet formulae, motion along a curve in two and three dimensions. Newton's first and second laws.

Particle motion with two degrees of freedom: Projectiles. Acceleration in polar coordinates. Properties of conics, central forces. Kepler's laws of planetary motion. Stability of motion.

Particle motion in three dimensions: Examples from cartesian and cylindrical geometry.

Particle interaction: Two particles - Newton's third law. Conservation of momentum. Collision and separation.

Systems with changing mass: Accretion of matter. Rocket motion.

Waves: Frequency, period, wavenumber, wavelength, harmonics. E.g. mass(es) oscillating on spring(s); slight nonlinearity. Derivation of the wave equation for vibrating strings and/or membranes. Progressive and standing waves, super-position, beats. Dispersive waves.