

School of Mathematics

Module MA1242 — Mechanics II

2009-10

(JF Mathematics, JF Theoretical Physics & SF Two-subject Moderatorship)

Lecturer: Dr. Stefano Kovacs**Requirements/prerequisites:** prerequisite: MA1241**Duration:** Hilary term, 11 weeks**Number of lectures per week:** 3 lectures including tutorials per week

Assessment:

End-of-year Examination: This module will be examined jointly with MA1241 in a 3-hour examination in Trinity term, except that those taking just one of the two modules will have a 2 hour examination.

Description:

- More on Momentum and Energy (flow of mass: dynamics of systems with varying mass, elastic and inelastic collisions, centre of mass frame);
- Some mathematical aspects (gradient, Stokes' theorem);
- More on angular momentum (fixed axis of rotation, motion combining translation and rotation);
- Rigid body motion (angular velocity and angular momentum as vectors, the gyroscope, precession);
- Gravity (historical background: from Brahe and Kepler to Newton and from Newton to Einstein, Newton's law of gravitation, inertial and gravitational mass, experimental tests, limits of validity, applications: elementary systems, astronomical and astrophysical systems);
- Central forces (two-body problem, reduced mass, general properties of central force motion);
- Non-inertial frames and fictitious forces (accelerating non-rotating frames, rotating coordinate systems, centrifugal and Coriolis forces, tidal forces, rotating bucket and Mach's principle, the equivalence principle and origins of General Relativity, Galilean transformations, principle of Relativity);
- Elements of fluid dynamics.

Further information at http://www.maths.tcd.ie/~kovacs/Teaching/Mechanics/Classical_Mechanics.html

July 19, 2010