Physics PHS1022 - Advice for Students 2009

This document is intended for use by prospective students before the start of semester. It provides drafts of parts of the PHS1022 Unit Information booklet. PHS1022 explores electromagnetism and quantum physics, which are at foundations of modern science and technologies. PHS1022 is required to proceed to physics at level 2 and beyond.

PHS1022 is a challenging unit. Students are advised to prepare before the start of semester by reading at least some chapters in the textbook. This is particularly important for students who have not taken PHS1011 at Monash, including students from PHS1080, mid-year entry students and students who need time to build their understanding.

Refer to the main Undergraduate Handbook for the unit synopsis, objectives, assessment and pre-requisites. Students doing PHS1022 must have Year 12 Physics or PHS1080 (or equivalent) and some calculus ability (at least VCE Maths Methods 3-4).

Laboratory classes:- commence in Week 1 – please be sure to attend.

Textbook

Physics for Scientists and Engineers by Knight, packaged with *Mastering Physics* Student Access Kit (3/e Pearson 2008). Students who buy a 2nd hand copy of the textbook will be issued with a free web access code to *Mastering Physics* assignments early in the semester (see *Mastering Physics* folder on *Blackboard*).

Many other calculus based first year physics textbooks are also useful e.g.*Understanding Physics* by Cummings *Fundamentals of Physics* extended by Halliday, Resnick and Walker (6th--8th ed).

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Synopsis of Topics

The following aims only to give an overview; individual lecturers will provide detailed outlines. Worked examples in each section are recommended. A few End of Chapter Conceptual Questions and Exercise will give good practice.

Fields & Electricity	References Knight Textbook
Introduction to Fields. Newton's Law of Gravitation, gravitational field, concept of potential energy.	Ch.13.1 – 3, 4-5 (in part)
2. Electric Charges , Forces, Fields , Dipoles , Fields for Distribution of Charges	Ch.26, 27:1-3
3. Gauss' Law, Flux, Electric field in spherical, cylindrical and plane symmetries	Ch.28.
4. Electric Potential, Potential Energy, Equipotential Surfaces, Potential and Field,	Ch.29, 30:1-4;
5. Capacitance, Parallel Plate Capacitor, Dielectrics. RC Circuit charging, discharging, time constant.	Ch.30:5-7; 32.9.
Rotational Mechanics	
Rotational speed, acceleration. Rotational kinetic energy, Rotational (moment of) inertia, Torque, Newton's second law, Rolling, Rotational (angular) momentum.	Ch.12:
Planetary motion: Gravitational Potential Energy, Conservation of Rotational Momentum for planetary orbits..	Ch.13.5-6;

Magnetism	
The nature of the magnetic field **B,** and calculating **B** using the Biot-Savart law.	Knight: Ch.33.1-3
Magnetic field of a current carrying long straight wire and current loop. The magnetic dipole moment.	Knight: Ch. 33.4-5
Ampere's law and line integrals. The magnetic field of a solenoid.	Knight: Ch. 33.6
The magnetic force on a moving charge. Cyclotron and helical motion. The Hall effect.	Knight: Ch.33.7
Magnetic forces on current carrying wires. Forces and torques on current loops.	Knight: Ch. 33.8-9
Magnetic properties of matter. Magnetic properties of superconductors and magnetic resonance imaging.	Knight: 35.10
Electromagnetic induction. Motional EMF and eddy currents.	Knight: 34.1-2