Physics 2: Life Sciences and Environment (640-172), 2009

Physics 1 or Physics 1: Fundamentals, together with Physics 2: Life Sciences and Environment, introduce students to most of the main branches of physics and include a variety of applications in other areas of study in the sciences. They are suitable physics subjects for students wishing to major in physics or in the areas of life or environmental science. Physics 2: Life Sciences and Environment, emphasises applications and examples from contexts in the life sciences, including biomedical sciences and environment.

Prerequisites: VCE Unit 3/4 Physics or 640-171 or equivalent; VCE Unit 3/4 Mathematical Methods (either) or equivalent. It is assumed that students have knowledge of the material included in Physics 1 or Physics 1: Fundamentals.

Semester: 2
Credit points: 12.5
Contact hours: 36 lectures (3 per week)
11 one-hour tutorials (1 per week)
27 hours of practical work (pre-laboratory activities plus nine weeks of 2- or 3-hour workshop sessions)

Lecturers: Associate Professor Michelle Livett (lectures 1 to 10, 29 to 36)
Dr James McCaw (lectures 11 to 28)

Prescribed Textbook
Knight, R, Jones, B and Field, S College Physics: A Strategic Approach (Pearson, Addison-Wesley 2007)

Each student should possess a copy of the prescribed textbook, from which questions and problems will be recommended. Other useful books to which lecturers may refer can be found in the Baillieu Library.

Syllabus
The subject will cover most of the topics listed below, and will be illustrated by applications to life sciences. Vector notation and differential and integral calculus will be used whenever appropriate. New mathematical concepts that students may not have encountered in previous studies are introduced as required.

**Fluids:** Applications: blood pressure and the circulatory system, breathing and respiration Principles: pressure in fluids, fluid flow, viscosity;

**Thermal physics:** Applications: heating and cooling, energy balance of living organisms Principles: temperature and thermal energy, phase changes, heat transfer mechanisms, first law of thermodynamics;

**Electricity and magnetism:** Applications: bioelectricity, nerve conduction, electrical safety, power transmission, synchrotron, biological effects of electromagnetic fields Principles: electric charge and field, electric potential, capacitance, electric circuits, resistance, magnetic fields and forces, Faraday’s law of induction;

**Atomic physics and lasers:** Applications: fluorescence imaging and spectroscopy, laser surgery Principles: structure of the atom, photons, spectroscopy, interaction of light with matter;

**Radiation:** Applications: radiation safety, therapeutic uses of radiation Principles: the atomic nucleus, isotopes, nuclear decay and radiation, physical and biological half-life, ionising radiation; and

**Imaging:** Applications: modern biomedical imaging Principles: X-rays, CT-scans and angiography, positron emission tomography

Noticeboards
Notices for First-Year Physics appear on boards in the corridor outside the level 2 tutorial rooms (Physics podium building).
Online resources

The Learning Management System (LMS) sites for this subject will contain general subject information, contact details for staff, electronic versions of handouts and copies of PowerPoint slides as well as links to other internet sites of relevance to the subject. The site will be updated regularly throughout the semester.

To access the LMS site you will need to have activated your university e-mail account since you will be required to enter your login name and password. Lecturers in this and other subjects may choose to send you reminders and other useful information by email.

There are online Mastering Physics resources linked to the textbook, including guided problem solving for the recommended problems and provision of the text in the form of an ebook.

Tutorials

Tutorials associated with this subject are held weekly in the Physics Podium building (the eastern wing), in tutorial rooms on level 2, commencing in the second week of each semester.

Allocation to tutorials can be found on students’ individual timetable. Lists are also posted on the noticeboard in the level 2 corridor of the Physics Podium building in Week 1 of each semester.

All students are strongly advised to work regularly on the recommended questions and problems, as an ability to explain physics ideas and solve problems are important elements in passing the subject.

Laboratory workshop classes

The laboratory workshops will focus on developing students’ expertise in Semester 2 – Fluids, Thermal Physics, Circuits and Radiation. Students will complete a group of workshops in each area. Note that laboratory workshops begin in the second week of each semester.

The Physics 2: Life Sciences & Environment Lab Manual and the Physics Practical Notebook may be purchased in the Physics lab during the first week of the semester at times to be advertised in lectures.

Laboratory classes are in the Physics 1 Laboratories on the 3rd and 4th levels of the Physics Podium Building.

The mark for laboratory work counts as part of the overall result, and satisfactory completion of this component is required for a pass in the subject (see below under assessment).

Tests and assignments for feedback

To encourage first-year students to work systematically throughout each semester, and to provide two-way feedback on student progress, lecturers will set regular assignments and tests of various kinds.

There will be three assessment tasks for feedback each semester:

(1) A 20 minute short-answer test to be answered in a lecture in Week 4 (5%)
(2) An individual assignment due in Week 8 (5%)
(3) A 20 minute examination-type question to be answered in a test in Week 10 (5%)

Assignment coversheet: Each assignment must be submitted with a signed coversheet, available from the subject’s LMS Assessment resources page. Students should be familiar with the University’s policy on academic honesty and plagiarism which can be found at http://www.academichonesty.unimelb.edu.au.

Assignment extensions: any requests for extension to the due date for the assignment are submitted to the Director of First-Year Studies, using the form available on the LMS Assessment resources page. Since students are expected to be planning their work to meet the submission deadline, extension requests must be submitted at least three days before the due date. Consideration will be given to circumstances outside a student’s control that have significantly hampered their ability to complete the assignment by the due date.

Absence from a test or laboratory workshop: If a student is absent for a reason that is outside their control, medical or otherwise, they should present the relevant documentation (eg. medical certificate) to the teaching administration officer, Mr Colin Entwisle, in the First Year Learning Centre as soon as possible so that he can reschedule the workshop or test if it is possible.

Assessment

Ongoing assessment of practical work during the semester (25%); two written tests with a total duration of up to 1 hour, held early and mid semester (10%); one written assignment requiring up to 4 hours of work outside class time during the semester (5%); a 3-hour written examination in the examination period (60%).

Satisfactory completion of practical work is necessary to pass the subject (i.e. attendance and submission of work for at least 80% of workshop sessions together with a result for assessed work of at least 50%).