

UNIVERSITY OF SUSSEX

Department of Physics and Astronomy

INTRODUCTION TO MODERN PHYSICS

Autumn Term 2006

Aims and Objectives

The course will provide an overview of topics in modern physics and will provide an initial platform for core courses in quantum mechanics, atomic physics, condensed state physics, and nuclear physics.

Syllabus

1. **Non-classical physics:** radiation and quantization of energy, heat capacity of solids at low temperature, photo-electric effect, Compton effect, line spectra.
2. **Wave-particle duality:** the de Broglie wavelength, Heisenberg's uncertainty principle, probability densities.
3. **Atomic physics:** Bohr theory, building of atoms, quantization of angular momentum.
4. **Condensed matter physics & nuclear physics:** conduction of electrons in metals, elementary band theory, metals; basic features of nuclei and nuclear reaction processes.

Learning outcomes

This is what's needed to *pass* without doing well. At the end of the course the student should be able to:

- Summarise the features of some physical models important in the development of physics in the early 20th century.
- Explain some experimental results that were significant in the development of quantum theory.

Textbooks

The recommended textbook is:

- H. D. Young and R. A. Freedman, *Sears and Zemansky's University Physics: With Modern Physics – 11th international ed.* (Pearson Addison Wesley). Chapters 38-43.

Alternative textbooks (previously used for the course):

- P. A. Tipler, *Physics for Scientists and Engineers* (Freeman).
- D. Halliday, R. Resnick and K. S. Krane, *Physics*, volume 2 extended version (Wiley)

More specialized textbooks which cover much of the material in greater detail are:

- A. Beiser, *Concepts of Modern Physics* (McGraw Hill).
- P. A. Tipler and R. A. Llewellyn, *Modern Physics* (Freeman).

Teaching activities

There will be two lectures per week for weeks 1-5 (Monday 13.00 and Tuesday 13.00 in Arundel 401) and one (compulsory) workshop per week for weeks 1-4 (Thursday 13.00 PEV1-2A12). A test will be held in week 5 in the workshop slot. Problem sheets will be handed out for the workshops and must be handed in for marking. Electronic copies of the problem sheets, and other information, will be placed on the course web page: <http://astronomy.sussex.ac.uk/~iw21/modernphysics/>

Assessment

- **50% problem sheets:** Both of the two problem sheets will count for assessment, i.e. each problem set is worth 25% of the course. **Rigid deadlines** will apply to the submission of course work (i.e. no credit if late – there is no 24-hr lateness margin).
- **25% test:** There will be a 40–50 minute end of course test which will be held in week 5 (Thursday 2nd November, 13.00).
- **25% essay:** One essay is required as part of the assessed coursework. A selection of essay titles will be available soon. The deadline for submission of the essay will be 12 noon on the first Wednesday of the Spring term (10th January 2007).
- There is **no summer examination**.

Plagiarism

The following statement has been issued by the Subject Group on plagiarism and related issues:

“We encourage you to discuss problems on example sheets with your fellow students—you will find that this is an excellent way to sharpen your understanding. However, the actual written work that you hand in must be your own. The University has compulsory and severe penalties for *plagiarism* (submitting somebody else’s work as your own), *collusion* (allowing somebody else to copy your work) and *fabrication* (making up results) which apply to all work submitted for credit. (There is a simple test that you can apply to avoid *plagiarism*—just ask yourself if you could explain the details and method of your solution to a member of faculty. Notice that this has nothing to do with whether or not the answer is right, or wrong, but rather whether the answer is an accurate description of what the student who submitted it was thinking.)”

Lecturer

Dr Ian Waddington, Arundel building, room 233. My office hour is Thursday 12-1pm, but you are welcome at other times as well. E-mail: I.Waddington@sussex.ac.uk