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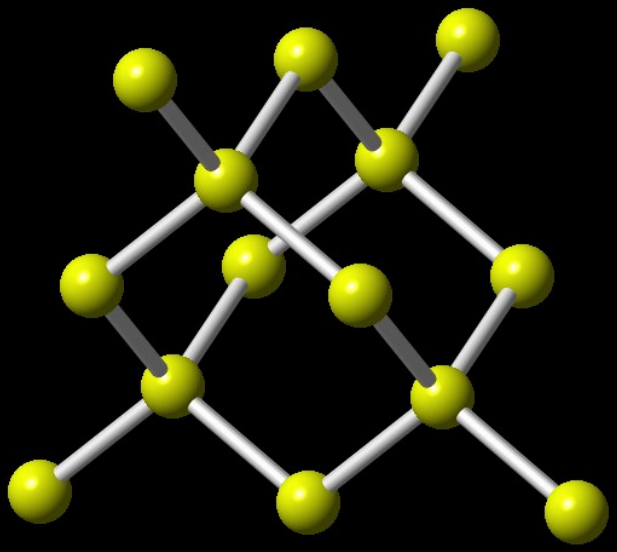

PHYS4027
Semiconductor Physics

Course Information Guide 2023-24

1 Course Details

PHYS4027 Semiconductor Physics is a level 4 Physics Honours course. It is composed of 18 lectures, all given in Semester 2.

Lecturer:
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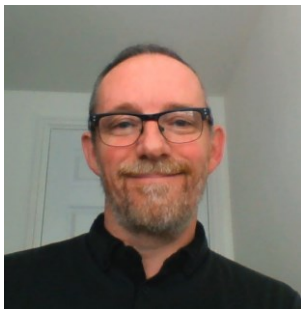

Recommended Text: SM Sze – Semiconductor devices, Physics and Technology (vol. 2)
Or
SM Sze and KK Ng, Physics of Semiconductor Devices (vol. 3) – available for download as an eBook from https://glasgow.rl.talis.com/index.html

Course notes and Question Sheets will be made available on Moodle.

2 Assessment

The course will be assessed via an examination in the April/May diet. It provides 10 H-level credits.

3 Required Knowledge

Students are expected to have completed PHYS4028 Solid State Physics.

4 Intended Learning Outcomes

By the end of the course, students will be able to demonstrate a knowledge and broad understanding of Semiconductor Physics. They should be able to describe and analyse quantitatively processes, relationships and techniques relevant to the topics included in the course outline, applying these ideas and techniques to solve general classes of problems which may include straightforward unseen elements. They should be able to write down and,

where appropriate, either prove or explain the underlying basis of physical laws relevant to the course topics, discussing their applications and appreciating their relation to the topics of other courses taken.

5 Course Outline

5.1 Fundamental semiconductor physics

We will cover the structure and chemistry of semiconductors, and the basic points of band structure, density of states, density of charge carriers in undoped and doped materials (and the temperature dependence thereof), mobility of charge carriers and its temperature dependence. We then consider the transport properties and derive the continuity equations before using these to consider some simple cases including light falling on a semiconductor, the Haynes-Shockley experiment and the *p*-*n* junction.

5.2 Semiconductor devices

We will consider qualitatively the main procedures used in the manufacture of semiconductor devices. We will then consider a range of common semiconductor devices and their functionality (including the current-voltage behaviour in most cases). Devices considered included bipolar transistors, MOSFETs and other field effect transistors, low dimensional devices, light emitting diodes and diode lasers, photodiodes and radiation detectors, and photovoltaics.