

PHYS412-24S1

ADVANCED SOLID STATE PHYSICS

(AND NANOTECHNOLOGY)

Lecturer 1: Ilia Valov (*~12 lectures*)
Room: TBC

Lecturer 2: Simon Brown (*~6 lectures*)
Room: West 808

Solid state physics and nanotechnology are among the most important subjects in modern physics – they underpin the understanding of modern electronic devices and are the basis of many, many new physics discoveries (check out the list of Nobel prizes in the last 40 years e.g. graphene, the quantum Hall effect, integrated circuits). At the core of these subjects is the behaviour of the electrons in materials, which can be understood using quantum mechanics.

The aim of this course is for you to learn about nano-electronic devices.

In the first part of the course we are fortunate to have an internationally renowned Erskine visitor, Ilia Valov, who will be teaching about memristors – basic devices properties, fundamental principles, and their applications in brain-like computing.

The final section of the course focuses on modern devices (e.g. transistors, semiconductor lasers).

Textbooks

(Introduction to) Solid State Physics by Hook & Hall. This is a bit easy and we won't use it that much.

Note: e-book available on library website:

<https://ebookcentral.proquest.com/lib/canterbury/detail.action?docID=1212553>

Short Course Outline

No. of lectures

- Part I: Memristors ~ 12
- Part II: Low Dimensional Semiconductors and Devices ~ 6

Notes

There will be 3 lectures a week for the first 4 weeks of the semester, and 2 lectures a week after that.

It is important that you attend lectures **in person**.

Assessment

3 Assignments	7% each
1 Test:	9%
<i>Total Internal Assessment</i>	<i>30%</i>
<i>Exam</i>	<i>70%</i>

Test

Please note that the test will be at the end of the **third week** of the semester, and it will be **in the evening**. To be confirmed. Please keep 6pm on Wed / Thurs 6 / 7 March free.

This is a bit unusual but because Ilia is only in Christchurch for 1 month I want to make sure all the lectures are available to him for teaching.