

Electronic Materials and Devices - Course Outline

ECEN 330: 2012 Trimester 2

The course studies the materials and devices employed in the modern electronics industry. Topics include the crystal structure and band theory of solids and the electronic, magnetic, dielectric and optical properties of materials. It will also look at a number of electronic devices and their structures such as diodes, transistors, solar cells and crystal resonators.

This document sets out the workload and assessment requirements for ECEN 330. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures and/or on the course web site. A printed copy of this document is held in the School Office.

Objectives

On successfully completing this course, students should be able to

1. Understand the electronic band structure of solids and to be able to describe the conduction process in semiconductor materials. (BE graduate attribute 3(a))
2. Understanding of the structure, magnetic, optical and dielectric properties of various materials to be able to describe their application in electronic devices. (BE graduate attribute 3(a))
3. To be familiar with the operation and device structures of a range of fundamental electronic devices. (BE graduate attribute 3(b, c))
4. To be familiar with the use of appropriate measurement and experimental techniques for determining properties of electronic materials and device structures and to be able to write clear reports detailing your results. (BE graduate attribute 2(b), 3(d))

Prerequisites

The prerequisites for ECEN 330 are:

- ECEN 203 or ELEN 201 or PHYS 235

Course Content

The course will cover the following main topics:

1. Introductory concepts in material science.
2. Carrier transport phenomena
3. Energy bands and electronic properties of semiconductors
4. Selected semiconductor devices
5. Dielectric properties of materials
6. Magnetic properties of materials
7. Optical properties of materials and photonic devices.
8. Introduction to microfabrication

Course materials and texts

Course notes will be made available on Blackboard as the course progresses. No textbook is required, but a number of books in the VUW library can be referenced as suitable background reading material. Some examples are:

- S.M.Sze, *Semiconductor Devices, Physics and Technology*
- S.O. Kasap, *Electronic Materials and Devices*
- D. Jiles, *Electronic Properties of Materials*

Lectures, Tutorials, Laboratories, and Practical work

- **Lectures:** Mondays, Tuesdays and Fridays from 12:00 pm to 12:50 pm in CO118.
- **Labs:** Four laboratory projects are scheduled during the course.

Assignments and Laboratory Work

The assessment for ECEN 330 involves regular assignments, an in-term test, four laboratory projects and a final exam as detailed below:

Assessed Item	Length / Duration	Due Date	Objectives Assessed
Laboratory projects		Due: 5 Aug, 5 Sept, 23 Sept, 14 Oct	2, 3 4
Assignments		Weekly 1-12	1-3
Test	1 hour	9 Sept in class time	1-4
Final Exam	3 hours	TBA during the examination period of 17 Oct 2011 to 13 Nov 2011	1-4

- **Laboratory Work** Four laboratory projects will be scheduled during the course, with approximately three weeks allowed for completion of each of these projects. At the completion of each project a report on the project must be handed in. Measurement work for the laboratories may be performed in pairs but all data analysis and report writing must be performed individually. It is strongly advised that you keep detailed notes for all laboratory work in a logbook. In addition, data acquired/graphs plotted should be electronically stored and kept to the end of the course.
- **Assignments** Assignments will be set approximately once every two weeks and should be handed in before the required deadline.
- **Handing in of work** A drop box on the second floor of the Laby building will be marked for your laboratory reports or assignments.
- **Late Work** All work is due in on the due date. Marks will be deducted at a rate of 10% of the full mark for each working day late. Work will not be marked if more than 1 week late. Extensions must be requested in writing (email) and will only be given in exceptional circumstances, and if agreed before the due date.

Workload

On average, students should plan to spend a minimum of 10 hours per point i.e., 150 hours for a 15 point course, or 10-12 hours per week, including exam periods, in order to achieve an average grade for this course.

School of Engineering and Computer Science

The School office is located on level three of the Cotton Building (Cotton 358).

Staff

The course organiser and lecturer for ECEN 330 is Gideon Gouws. His contact details are as follows:

- *Gideon Gouws*
- AM225
- +64 4 463 5952
- Gideon.Gouws@ecs.vuw.ac.nz

Announcements and Communication

This course uses Blackboard. Course materials and other information will be posted on Blackboard. Students should check Blackboard regularly.

Registered students will find information on Blackboard at: <http://blackboard.vuw.ac.nz>

Assessment

Your grade for ECEN 330 will be determined based on the following assessment weightings:

Assessed Item	Weight
Laboratory projects	20% - all projects to contribute equally
Assignments	10% - all assignments to contribute equally
Test	20%
Final Examination	50%

Plagiarism

Working Together and Plagiarism

We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work.

The School policy on Plagiarism (claiming other people's work as your own) is available from the course home page. Please read it. We will penalise anyone we find plagiarising, whether from students currently doing the course, or from other sources. Students who knowingly allow other students to copy their work may also be penalised. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (eg, as a comment in the code) who helped you in writing the method.

Mandatory Requirements

Mandatory course requirements are as follows:

1. Satisfactory completion of all 4 laboratory projects.
2. A mark of at least 40% in the final exam

Passing ECEN 330

A final course mark (%) will be calculated as specified in the "Assessment" section above and grades will be assigned as follows:

Grade	Range of Course Marks (%)
A+	85% - 100%
A	80% - 84%
A-	75% - 79%
B+	70% - 74%
B	65% - 69%
B-	60% - 64%
C+	55% - 59%
C	50% - 54%
D	40% - 49%
E	0% - 39%
K	Failed to meet mandatory course requirements

To pass ECEN 330, a student must satisfy mandatory requirements and at least a **C** or better should be obtained.

Withdrawal

The last date for withdrawal from ECEN 330 with entitlement to a refund of tuition fees is Friday 27 July 2012. The last date for withdrawal without being regarded as having failed the course is Friday 28 Sept 2012 -- though later withdrawals may be approved by the Dean in special circumstances.

Rules & Policies

Find key dates, explanations of grades and other useful information at <http://www.victoria.ac.nz/home/study>.

Find out about academic progress and restricted enrolment at <http://www.victoria.ac.nz/home/study/academic-progress>.

The University's statutes and policies are available at <http://www.victoria.ac.nz/home/about/policy>, except qualification statutes, which are available via the Calendar webpage at <http://www.victoria.ac.nz/home/study/calendar> (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at <http://www.victoria.ac.nz/home/about/avcacademic>

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

Grievances

Student and Staff Conduct

Meeting the Needs of Students with Disabilities

Student Support

Academic Integrity and Plagiarism

Dates and Deadlines including Withdrawal dates

School Laboratory Hours and Rules

Printing Allocations

Expectations of Students in ECS courses

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.
