UNSW Course Outline

SOLA2060 Introduction to Electronic Devices - 2024

Published on the 01 Feb 2024

General Course Information

Course Code : SOLA2060
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Photovoltaic and Renewable Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Fundamentals of the operation and applications of a range of important semiconductor devices. Material covered includes basic semiconductor properties, pn junction theory, as well as the operating principles of bipolar junction transistors, Schottky diodes, MOSFETs, solar cells, and

other optoelectronic devices. Circuits relevant to renewable energy applications that incorporate these devices are introduced and analysed.

Course Aims

The aim of this course is to help students understand the principles of operation for fundamental electronic devices, and basic circuits incorporating them, relevant to Renewable Energy applications.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Calculate key parameters for semiconductors and fundamental structures of pn junctions.
CLO2 : Explain the operation of common semiconductor devices and calculate key parameters of these devices.
CLO3 : Build and analyse circuits consisting of electronic components including diodes and transistors.

Course Learning Outcomes	Assessment Item
CLO1 : Calculate key parameters for semiconductors and fundamental structures of pn junctions.	• Quizzes • Assignments • Final Exam
CLO2 : Explain the operation of common semiconductor devices and calculate key parameters of these devices.	• Quizzes • Assignments • Final Exam
CLO3 : Build and analyse circuits consisting of electronic components including diodes and transistors.	

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Other Professional Outcomes

https://www.unsw.edu.au/engineering/student-life/student-resources/program-design

Additional Course Information

You are expected to attend all lectures, workshops and labs in order to maximise learning. You will need to complete pre-work for some of your workshops and lab classes. In addition to the

lecture notes and recordings, you will be expected to read relevant texts as required. Group learning is encouraged, but any submitted work must be solely yours when not part of a group activity, in accordance with Student Responsibilities and Conduct. UNSW assumes that self-directed study of this kind is undertaken in addition to attending face-to-face classes throughout the course.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Quizzes Assessment Format: Individual	25%	
Assignments Assessment Format: Individual	25%	
Final Exam Assessment Format: Individual	50%	

Assessment Details

Quizzes

Assessment Overview

In class quizzes will be run during the term to assess understnading of material and allow students to gauge their understanding. Quizzes are worth 25% of final mark in total.

Course Learning Outcomes

- CLO1 : Calculate key parameters for semiconductors and fundamental structures of pn junctions.
- CLO2 : Explain the operation of common semiconductor devices and calculate key parameters of these devices.

Assessment Length

1 hour each

Assignments

Assessment Overview

There will be assignments associated with three laboratory sessions. The assignment will be a series of in-depth problems related to the lab material. Students will be expected to find additional material to help explain the results from their lab session. The assignments are worth 25% of final grade.

Course Learning Outcomes

- CLO1 : Calculate key parameters for semiconductors and fundamental structures of pn junctions.
- CLO2 : Explain the operation of common semiconductor devices and calculate key parameters of these devices.

Final Exam

Assessment Overview

Final Exam drawn mostly form tutorial problems and assignments.

Course Learning Outcomes

- CLO1 : Calculate key parameters for semiconductors and fundamental structures of pn junctions.
- CLO2 : Explain the operation of common semiconductor devices and calculate key parameters of these devices.

Assessment Length

Take home plus 30 minutes of oral examination

General Assessment Information

Grading Basis

Standard

Course Schedule

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

General Schedule Information

Lectures Tuesday 11 - 13, Thursday 11 - 13

Workshops Wednesday 9 - 12

Course Resources

Prescribed Resources

Recommended Texts: Principles of Semiconductor Devices, B. Van Zeghbroeck http://

truenano.com/PSD20phone/contents/title.htm

Software:

PC1D.Instal on your Windows PC simply unzipping this file: https://sourceforge.net/p/pc1d/code/HEAD/tree/downloads/. If you prefer, you can use PC1D via myAccess: https://myaccessunsw.cloud.com/

LTSpice.

Download and install on your computer from: https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html

Recommended Resources

Other recommended books

Hemami, A, Electricity and Electronics for Renewable Energy Technology: an Introduction, CRC Press, First edition., 2017 (a general knowledge, to a moderated level, about the devices used in power generation from some renewable energy sources).

Horowitz and Hill, Art of Electronics, Any edition, Cambridge University Press. (Good for understanding electronic concepts and circuit operation, light on the maths)

Helpful for semiconductors and pn junctions

https://www.pveducation.org/ (very good reserouce for semiconductor physics, in particular when applied to solar cells)

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Ivan Perez		TETB G22	+61 2 9065 1037	Th. 2-3pm	No	Yes
Demonstrator	Jamie Harrison				Please contact via MS Teams or email	No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning

environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

SPREE Student Information Hub

Students are welcome to visit the SPREE Student Information Hub for information such as sample study plans, course outlines, thesis project, industrial training etc.

School Contact Information

For course-related matters, please contact course convenor directly via emails. Please email spreeteaching@unsw.edu.au for any other matters.