School of
Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

# Prescription

This course is a practically oriented introduction to fundamental electronic devices and their circuit applications. Topics include semiconductor fundamentals, diodes, transistors and operational amplifiers.

# Course learning objectives

Students who pass this course should be able to:

1. Use a range of electronic measuring instruments.
2. Understand the basic characteristics of semiconductor materials and how these properties are utilised in the design of diodes and transistors.
3. Describe the functions and current-voltage characteristics of diodes and transistors and calculate circuit characteristics and behaviour employing these devices.
4. Design, prototype and test basic circuits using diodes and transistors.
5. Maintain a detailed laboratory log book and use this log to write design reports detailing the design process.

# Course content

The course is a practically oriented introduction to electronic devices and their circuit applications. Topics include semiconductor fundamentals, diodes and transistors, while basic circuit design, construction and testing will be introduced. The course builds on the basic electrical theory from ENGR 142/PHYS 115 and is a required course for ECEN students in the BE(Hons) and an elective course for BSc majors in both Physics and Applied Physics as well as Electronics and Computer Systems. ECEN 204 is a prerequisite for the third year engineering course ECEN 303.

# Required Academic Background

A basic background in electronic circuits and their analysis as well as the properties of passive components (resistors, capacitors and inductors)

# Withdrawal from Course

Withdrawal dates and process:
https://www.wgtn.ac.nz/students/study/course-additions-withdrawals

# Lecturers

## Ramesh Rayudu (Coordinator)

ramesh.rayudu@vuw.ac.nz 04 4635233 ext 8068

421 Alan MacDiarmid Building, Kelburn

## Gideon Gouws

Gideon.Gouws@vuw.ac.nz 04 4635952

225 Alan MacDiarmid Building, Kelburn


# Teaching Format

This course will be offered in-person and online. For students in Wellington, there will be a combination of in-person components and web/internet based resources. It will also be possible to take the course entirely online for those who cannot attend on campus, with all the components provided in-person also made available online.

During the trimester there will be three lectures per week as well as a three hour laboratory session (for five weeks) which will start in Week 2.

# Student feedback

Towards the end of the course, student surveys on both the course lecturing and the course itself will be carried out. The results of previous course surveys can be found at http://www.cad.vuw.ac.nz/feedback/feedback_display.php

# Dates (trimester, teaching & break dates)

- Teaching: 13 July 2020 - 18 October 2020
- Break: 17 August 2020 - 30 August 2020
- Exam period: 19 October 2020 - 25 October 2020

# Class Times and Room Numbers

**13 July 2020 - 16 August 2020**

- **Monday** 14:10 - 15:00 – LT118, Laby, Kelburn
- **Wednesday** 16:10 - 17:00 – LT001, Hugh Mackenzie, Kelburn
- **Thursday** 14:10 - 15:00 – LT101, Murphy, Kelburn

**31 August 2020 - 18 October 2020**

- **Monday** 14:10 - 15:00 – LT118, Laby, Kelburn
- **Wednesday** 16:10 - 17:00 – LT001, Hugh Mackenzie, Kelburn
- **Thursday** 14:10 - 15:00 – LT101, Murphy, Kelburn

# Other Classes

A three-hour laboratory must also be attended when scheduled. These laboratory sessions will start in Week 2 of the trimester and will take place in LB217. The times of these laboratory sessions will be communicated on Blackboard/ECSWiki.

# Set Texts and Recommended Readings

## Required

The textbook for the course is:

"Electronic Devices (Conventional current version)" by Thomas L. Floyd. The 9th edition should be available in the VUW bookshop at ~$140. Other editions of the book is also good. It can also be purchased as an eText book from Pearson at a cost of ~ $70 – see http://www.pearsoned.co.nz/9781292038070. It is highly recommended that you obtain a copy of this text as the course is well aligned with this textbook. Parts of this book will also be useful in ECEN 203.

## Recommended

Other books that may be of interest:

"The Art of Electronics" by Horowitz and Hill – a classic guide to electronics but not light reading !

"Electronics Fundamentals" by Floyd and Buchla - a bit low level

"Practical Electronics for Inventors" Third Edition – Paul Sherz and Simon Monk. This book is available from Amazon in both paper and ebook formats and is not an academic textbook, but a real practical guide to electronics. Highly recommended !

A wide variety of material is also available on the web. A good example is the "Lessons in Electric Circuits" at www.allaboutcircuits.com which covers a wide variety of electronic topics.

# Mandatory Course Requirements

In addition to achieving an overall pass mark of at least 50%, students must:

- Satisfactorily complete all four (Weeks 4, 5, 8 and 11) of the five physical laboratories; meaning you have completed the laboratory at LB217 and have made a reasonable attempt to complete and hand in the laboratory report.

*If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.*

# Assessment

This course will be assessed through assignments and in-term tests.

| Assessment Item | Due Date or Test Date | CLO(s) | Percentage |
|---|---|---|---|
| Assignments (6) Online Versions | July 27, Aug 10, Aug 31, Sep 14, Sep 28, Oct 12 | CLO: 1,2,3 | 20% |
| Test 1 | Week 3 | CLO: 1,2,3 | 20% |
| Test 2 | Week 6 | CLO: 1,2,3 | 20% |
| Test 3 | Week 9 | CLO: 1,2 | 20% |
| Test 4 | Week 13 | CLO: 1,2,3 | 20% |

## Penalties

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 one week late or if the model answers have

already been handed back to the class. **Any work that is late (after the due date) should not be put in the drop boxes but should be directly handed to the course lecturer.**

## Extensions

All work is due in on the due date and individual extensions will only be granted in exceptional personal circumstances, and should be negotiated in writing with the course lecturer before the deadline whenever possible. Documentation (eg, medical certificate) may be required.

## Submission & Return

Drop boxes outside LB217 (the laboratory) will be used for handing in of both laboratories reports and assignments. Any work that is late (after the due date) should not be put in the drop boxes, but should be directly handed to the course lecturer. Marked material will be handed back in class or lab or can be collected from the ECS school office on the third floor of Cotton (CO358).

## Group Work

The course contains no group work.

# Workload

The total workload for ECEN204 is 150 hours. In order to maintain satisfactory progress, you should plan to spend an average of 10 hours per week on this course. A plausible and approximate breakdown for these weekly hours would be:

- Lectures and tutorials - 3 hours
- Laboratory work and writeup - 4 hours:
- Self-study - 3 hours

Additional time will be required for tests

# Teaching Plan

The planned course content is as follows:

**Semiconductor Properties:** basic properties of intrinsic and extrinsic semiconductors

**Diodes:** p-n junctions, biasing, diode characteristic, diode models, rectification and diode applications, light emitting diodes and other diodes.

**Bipolar Junction Transistors (BJTs):** structure and operation, current gain, transconductance, input, transfer and output characteristics, BJT as an amplifier - inverting amplifier, dc biasing, small signal approximations, different transistor configurations, Class A amplifier design.

**MOSFETs:** structure and operation, input, transfer and output characteristics, dc circuits, MOSFETs as logic gates and amplifiers

New Topics: Introduction to IGBTs and Thyristors.

# Communication of Additional Information

This course uses Blackboard. Course materials and other information will be posted on Blackboard. Students should check Blackboard regularly. Please ensure that the email address you have provided for university administration is correct in order to receive notifications from staff.

# Links to General Course Information

- Academic Integrity and Plagiarism: https://www.wgtn.ac.nz/students/study/exams/integrity-plagiarism
- Academic Progress: https://www.wgtn.ac.nz/students/study/progress/academic-progess (including restrictions and non-engagement)
- Dates and deadlines: https://www.wgtn.ac.nz/students/study/dates
- Grades: https://www.wgtn.ac.nz/students/study/progress/grades
- Special passes: Refer to the Assessment Handbook, at https://www.wgtn.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf
- Statutes and policies, e.g. Student Conduct Statute: https://www.wgtn.ac.nz/about/governance/strategy
- Student support: https://www.wgtn.ac.nz/students/support
- Students with disabilities: https://www.wgtn.ac.nz/st_services/disability/
- Student Charter: https://www.wgtn.ac.nz/learning-teaching/learning-partnerships/student-charter
- Terms and Conditions: https://www.wgtn.ac.nz/study/apply-enrol/terms-conditions/student-contract
- Turnitin: http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin
- University structure: https://www.wgtn.ac.nz/about/governance/structure
- VUWSA: http://www.vuwsa.org.nz

**Offering CRN: 28324**

**Points:** 15
**Prerequisites:** ENGR 122 or MATH 142; ENGR 142 or PHYS 115;
**Restrictions:** PHYS 235, (ECEN 201 and ECEN 203 prior to 2016)
**Duration:** 13 July 2020 - 25 October 2020
**Starts:** Trimester 2
**Campus:** Kelburn