

Power Electronics - Course Outline

ECEN 405: 2012 Trimester 1

ECEN 405 covers theory, design and application of power electronic circuits and the transformation and control of electrical energy.

This document sets out the workload and assessment requirements for ECEN 405. 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

By the end of the course, students should be able to:

1. Understand the terminology inherent in Power Electronics and be able to calculate figures of merit such as THD (both voltage and current), FF, CF, ripple, etc. (BE graduate attribute 3(a))
2. Understand and be able to practically implement different rectification techniques. The student should appreciate the advantages/disadvantages of each technique, and be able to make an appropriate design decision for a specific electronic application. (BE graduate attribute 3(a, b))
3. Be able to understand the function and applicability of a wide range of dc-dc converters including Buck, Boost, Buck-boost, Cuk, Forward, Flyback, Push-Pull Bridge and resonant converter techniques. The student should appreciate the advantages/disadvantages of each technique, and be able to make an appropriate design decision for a specific electronic application. (BE graduate attribute 3(a, b))
4. Understand the design issues for an inverter circuit including an appreciation of how different design topologies affect the resulting harmonics. (BE graduate attribute 3(a, b))
5. Appreciate at both a theoretical and practical level, the protective devices necessary when switching inductive loads. (BE graduate attribute 3(a, b))
6. Appreciate at both a theoretical and practical level, driver circuits required to interface to power switching devices. (BE graduate attribute 3(a, b))
7. Be able to implement an effective power control circuit for a dc motor. (BE graduate attribute 3(a, b, c))
8. Provide an oral presentation during the course dealing with a specified topic in Power Electronics. They will be required to answer questions from their peers and the course instructors. (BE graduate attribute 2(a, b))
9. Provide appropriate written documentation to support the practical assessment items in the course. Specifically they will be required to report on the justification for their design methodology, an explanation of the functioning of their circuit, and an evaluation of their working solution. (BE graduate attribute 2(a, b), 3(a, b, c, d, e, f))

Prerequisites

The prerequisites for ECEN 405 are:

- ECEN 303 or ELEN 301 or PHYS 340

Course Materials and Textbook

For all lectures students will be provided with a comprehensive study guide which contains the entire lecture OHTs and additional lecture material. A complete PDF of these slides is available via Blackboard for students. An effort will be made to provide lecture notes during the lectures.

The textbook for ECEN 405 is: *Mohan, Undeland, Robins, Power Electronics, Converters, Applications and Design, 3rd edition, Wiley.*, along with any other notes or materials required

Lectures, Tutorials, Laboratories, and Practical work

- **Lectures:** Tuesdays (CO118), Thursdays (KK203) and Fridays (CO118) from 12:00 - 12.50 pm
- **Labs:** One 3-hour lab/week will be held in CO250 on Tuesday from 13:10 - 17:00 and a catch-up lab is booked on Monday 11:00 am - 3:00 pm. The allocated lab times should also be used towards the design assignment

Assignments and Projects

The assessment for ECEN405 involves assignments, two in-term tests, weekly laboratories, and design report as detailed below:

Assessed Item	Length/ frequency	Date due / exam period	Objectives assessed
Laboratory Work	Weekly report	Weeks 3 - 6	1 - 7
Assignments	2	Weeks 2 and 7	1 - 8
Design Report	tbd	Weeks 1 - 12	9
Test 1	1 hour	Week 7	1 - 3
Test 2	1 hour	Week 12	1 - 7
Research Topic Presentation	11	Week 11	8

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 in 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 for ECEN 405 is Ramesh Rayudu. His contact details are:

- *Ramesh Rayudu*
- Cotton 352
- +64 4 463 5733 Ext 8068
- Ramesh.Rayudu@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 405 will be determined based on the above assessment weightings:

Assessed Item	Weight
Laboratory Work	10%
Assignments	15%
Design Report	40%
Test 1	10%
Test 2	10%
Research Topic Presentation	15%

Tests and Exams

There is NO final exam for this course and there will be two term tests in week 7 and Week 12.

Practical Work

There will be a field trip to HAYWARDS substation on Monday 23rd April 12pm - 4pm

Policies and penalties for late submission

Late assessment will be penalised at the rate of 5% for every day the assessment is late. The lecturer may refuse to mark work that has been handed in over a week late, and may also refuse if the assessment has been marked and returned to the class. In such instances, a zero grade for that assessment shall result.

In the event of an approved application, regular submission and performance in assignments and laboratories will

contribute substantially to the outcome.

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

It is expected that ALL work will be completed and handed in for marking. An incomplete or fail grade (K) will be issued to any student who does not satisfy ANY of the below requirements

1. Satisfactorily completes all assigned labs (a demonstrator must verify all lab work).
2. Attempts both the two assigned internal tests
3. Hands in all 2 assignments
4. Scores more than 40% (average) on **both** the internal tests

Passing ECEN 405

To pass ECEN 405, a student must satisfy mandatory requirements and gain at least a **C** grade overall.

Withdrawal

The last date for withdrawal from ECEN 405 with entitlement to a refund of tuition fees is Friday 16 March 2012. The last date for withdrawal without being regarded as having failed the course is Friday 18 May 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.
