Prescription

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

Course learning objectives

Students who pass this course should be able to:

1. Explain the terminology inherent in Power Electronics and be able to calculate figures of merit such as Total Harmonic Distortion (THD) (both voltage and current), Form Factor, Crest Factor, ripple, etc.(BE graduate attribute 3(a))
2. Interpret and be able to implement and analyse different rectification, switch-mode and inversion techniques (BE graduate attribute 3(a, b)).
3. Design decision different power electronic converters for a wide variety of electronic applications. (BE graduate attribute 3(a, b))
4. Design and demonstrate the operation of a power electronic system. (BE graduate attribute 1(b), 2(a), 3(b, d, e, f))
5. Practically inspect power converter topologies in an industrial environment and recognise the safety issues of working in an industrial environment. (BE graduate attribute 1(b), 2(b), 3(b,d,e))

Course content

Topics include switching devices and their properties, power quality indices, Designing switching poles, Switch mode converter design, Magnetics design, Power factor correction, Feedback control of converters, Electric Motors and drives, Rectification and Inversion.

The course is primarily offered in-person, but there will also be a remote option and there will be online alternatives for all the components of the course for students who cannot attend in-person.

Students taking this course remotely must have access to a computer with camera and microphone and a reliable high speed internet connection that will support real-time video plus audio connections and screen sharing. Students must be able to use Zoom; other communication applications may also be used. A mobile phone connection only is not considered sufficient. The computer must be adequate to support the programming required by the course: almost any modern windows, macintosh, or unix laptop or desktop computer will be sufficient, but an Android or IOS tablet will not.

If the assessment of the course includes tests, the tests will generally be run in-person on the Kelburn campus. There will be a remote option for students who cannot attend in-person and who have a strong justification (for example, being enrolled from overseas).
The remote test option will use Zoom for online supervision of the tests and you must be able to use Zoom with a camera, microphone, and screen-sharing. Students who will need to use the remote test option must contact the course coordinator in the first two weeks to get permission and make arrangements.

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

Daniel Burmester

daniel.burmester@vuw.ac.nz 04 4639998

404 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 and one lab per week.

Student feedback

Student feedback on University courses may be found at:
www.cad.vuw.ac.nz/feedback/feedback_display.php

Dates (trimester, teaching & break dates)

- Teaching: 05 July 2021 - 08 October 2021
- Break: 16 August 2021 - 29 August 2021
- Study period: 11 October 2021 - 14 October 2021
- Exam period: 15 October 2021 - 06 November 2021

Class Times and Room Numbers

05 July 2021 - 15 August 2021

- **Tuesday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn
- **Wednesday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn
- **Friday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn

30 August 2021 - 10 October 2021

- **Tuesday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn
- **Wednesday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn
- **Friday** 09:00 - 09:50 – 102, Alan MacDiarmid Building, Kelburn

Other Classes

3 hour lab each week, starting in the second week.

There will be a field trip to HAYWARDS substation as part of this course. The date of the trip will be notified in the class.

Set Texts and Recommended Readings

Required

There are no required texts for this offering.

Mandatory Course Requirements

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

- Satisfactorily complete all assigned labs
- Make a reasonable attempt to complete the design aspect of the project and submit a design report.
- Score more than 40% (average) in the internal tests.

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 laboratory, assignments, design report, a lecture and a test.

There is NO final exam for this course and there will be a term test in week 11.

Practical Work
There will be a field trip to HAYWARDS substation as part of this course. The date of the trip will be notified in the
class. Remember you need to write a report on your trip and submit. Your report is worth 5%.

Laboratory Work
The course has SIX experiments and a design assignment for 6 weeks associated with it. All experimental work
must be started in the scheduled lab time. If you do not complete the work in this session, arrangements can be
made to complete at a later stage (before the next session). However, no laboratory demonstrators will be available
out of sessions. This report must be handed in no later than one week after the experiment had been scheduled.

It is required that you keep detailed experimental notes for all experiments in a logbook. In addition, data acquired/graphs plotted should be electronically stored and kept to the end of the course. A log book will be provided to keep a log of your research activities for your design assignment. The log book will be
marked and will contribute towards your project mark.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
Laboratory Work (weekly)	Wednesdays Weeks 3 to 8	CLO: 1,2,3	30%
Assignments (weekly)	Weeks 6 and 10	CLO: 1,2,3	20%
Design Project	Exam Period	CLO: 4,5	25%
Test (1 hour)	Week 11	CLO: 1,2,3	20%
Lecture on Power Amps	Week 9	CLO: 4,5	5%

Penalties

Late assessment will be penalised at the rate of 10% for every working 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.

Extensions

Individual extensions will only be granted in exceptional personal circumstances, and should be negotiated with the course coordinator before the deadline whenever possible. Documentation (eg, medical certificate) may be required.

Submission & Return

All submissions must be submitted on the ECS Wiki. The marked assessment will be returned on the ECS Wiki too.

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 hours per week, including exam periods, in order to achieve an average grade in this course.

3 Hours Lectures

2 Hours Labs and Project

2 Hours Assignments

1 Hour Reports

2 Hours Study

Teaching Plan

See: https://ecs.wgtn.ac.nz/Courses/ECEN405_2021T2/LectureSchedule

Communication of Additional Information

All online material for this course can be accessed at https://ecs.wgtn.ac.nz/Courses/ECEN405_2021T2/

- 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: 18521

Points: 15
Prerequisites: ECEN 303 (or PHYS 340)
Duration: 05 July 2021 - 07 November 2021
Starts: Trimester 2
Campus: Kelburn