



## Prescription

This course covers the theory, design and application of electrical machines, power electronic circuits, electric drives, and the transformation and control of electrical energy. The course introduces the fundamentals of electromagnetics and electrical machines, as well as power electronics and discusses the design issues related to electrical drives and small-scale power generation. Practical work will involve the design, development, and implementation of solutions to drive motors, convert renewable power, and switch mode power amplifiers.

## Course learning objectives

Students who pass this course should be able to:

1. Explain the advantages/disadvantages of different converter topologies (WA2)
2. Evaluate the key features and operational aspects of power electronic systems (WA2)
3. Evaluate the key features and operational aspects of electric machines and their converter systems (WA2)
4. Design electric power conversion systems using common components and configurations (WA3)

## Course content

This course is a lab-based course. Labs and tests will require in-person attendance by students in the Wellington Region. There will be online options for students outside the Wellington region, but students will have to complete alternative substitutes to the physical lab requirements. The remote option for tests will use a Zoom-based system for online supervision of the tests.

Students taking this course remotely from outside the Wellington region 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 practical work 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.

## Withdrawal from Course

Withdrawal dates and process:

<https://www.wgtn.ac.nz/students/study/course-additions-withdrawals>

## Lecturers

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## Daniel Burmester (Coordinator)

daniel.burmester@vuw.ac.nz 04 463 9998

AM 404 Alan Macdiarmid Building, Gate 7, Kelburn Parade, Kelburn

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## Dr Ramesh Rayudu

ramesh.rayudu@vuw.ac.nz 04 886 5332

AM 421 Alan Macdiarmid Building, Gate 7, Kelburn Parade, Kelburn

## Teaching Format

Weekly lectures, tutorials, laboratory sessions, and individual assignments during whole course.

## Student feedback

Towards the end of the course, student surveys on both the course lecturing and the course itself will be carried out.

## Dates (trimester, teaching & break dates)

- Teaching: 11 July 2022 - 14 October 2022
- Break: 22 August 2022 - 04 September 2022
- Study period: 17 October 2022 - 20 October 2022
- Exam period: 21 October 2022 - 12 November 2022

## Class Times and Room Numbers

### 11 July 2022 - 21 August 2022

- **Monday** 13:10 - 14:00 – 119, Cotton, Kelburn
- **Tuesday** 13:10 - 14:00 – 119, Cotton, Kelburn
- **Friday** 13:10 - 14:00 – 118, Cotton, Kelburn

### 05 September 2022 - 16 October 2022

- **Monday** 13:10 - 14:00 – 119, Cotton, Kelburn
- **Tuesday** 13:10 - 14:00 – 119, Cotton, Kelburn
- **Friday** 13:10 - 14:00 – 118, Cotton, Kelburn

## Other Classes

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

## Set Texts and Recommended Readings

### Required

No set texts for this course, however, the Ned Mohan book "*Power Electronics: A First Course*" will be useful and can be found in the library

## Recommended

Any book available in our Library related to power electronics and electrical machines are recommended.

## Mandatory Course Requirements

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

- Achieve at least 40% on the test

*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 has major lab content. The other assessment includes assignments, a test and a design exercise.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
Six Lab Sessions with Lab Reports	Due Wednesdays Weeks 3 to 11	CLO: 1,2	30%
Design Exercise with Report	Week 9	CLO: 1,3	10%
Two Assignments	Week 6 and Week 10	CLO: 2,3,4	20%
Two Test	Week 7 and assessment period	CLO: 1,2,3,4	40%

## 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.

## 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

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

## Workload

The student workload for this course is 150 hours.

## Teaching Plan

In EEEN313, the following subjects will be covered:

- PWM
- Switching power poles
- Buck converts
- Boost converters
- Buck-boost converters
- Feedback
- Thermal and Heat sinks
- Power - Distortion
- 3 phase systems
- Electromagnetism
- Electric motors
- Electric drives
- Power factor correction
- Magnetics design

## Communication of Additional Information

This course uses ECS Wiki ([https://ecs.wgtn.ac.nz/Courses/EEEN313\\_2022T2/](https://ecs.wgtn.ac.nz/Courses/EEEN313_2022T2/)). Course materials and other information will be posted on ECS Wiki. Students should check the Wiki regularly. Please ensure that the email address you have provided for university administration is correct in order to receive notifications from staff.

The recorded lectures will be available through the normal channel of BlackBoard and Panopto.

## 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-progress> (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/](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:** [33058](#)

**Points:** 15

**Prerequisites:** EEEN 203 (or ECEN 203), EEEN 204 (or ECEN 204)

**Duration:** 11 July 2022 - 13 November 2022

**Starts:** Trimester 2

**Campus:** Kelburn

