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

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

In 2021, it will be possible to take this course remotely, and distance-based versions of the lectures, labs, and all other material will be available. However, the resources for the remote alternative to the labs are limited, and the remote option will only be available for students with a good justification (for example, enrolling from overseas). Students who can be in Wellington must participate in the face-to-face labs to develop the critical practical lab knowledge and skills for the course.

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.

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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

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: 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

No Set texts for this course

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 8	CLO: 1,2	54%
Design Exercise with Report	Week 9	CLO: 1,3	6%
Two Assignments	Week 6 and Week 10	CLO: 2,3,4	20%
One Test	Week 11	CLO: 1,2,3,4	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.

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

The course is co-taught with ECEN 405 for 2021.
The teaching plan is as follows:
1. Lab related Power Electronics lectures will be delivered as part of the labs. The topics are:

1. PWM
2. Switching power poles
3. Buck converts
4. Boost converters
5. Buck-boost converters
6. Feedback
7. Thermal and Heat sinks

2. In lecture slots the following topics are covered:
1. Power - Distortion
2. 3 phase systems
3. ElectroMagnetism
4. Electric Motors
5. Electric Drives
6. Power Factor Correction
7. Magnetics Design

Communication of Additional Information

This course uses ECS Wiki (https://ecs.wgtn.ac.nz/Courses/EEEN313_2021T2/). 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-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: 33058

Points: 15
Prerequisites: EEEN 203 (or ECEN 203), EEEN 204 (or ECEN 204)
Duration: 05 July 2021 - 07 November 2021
Starts: Trimester 2
Campus: Kelburn