ELEC2005

Electrical and Electronic Systems

Session 2, In person-scheduled-weekday, North Ryde 2024

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit convenor
David Payne
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Contact via x9177
3 Management Drive, Room 230
Tue 3:30-5:30pm

Unit convenor
Leonardo Callegaro
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Contact via email
44 Waterloo Road, Level 1
Wed 2-4pm (upon email appointment)

Credit points
10

Prerequisites
(PHYS1520 or ENGG150) and (MATH1010 or MATH1015 or MATH135 or MATH132) and ELEC2070

Corequisites

Co-badged status

Unit description
This unit develops fundamental knowledge and skills in electrical and electronic technologies used in conventional and renewable energy applications, energy storage and electrical transportation. The main goal is to understand the need of power conversion and signal flow in such applications. Prior knowledge and skills in physics and mathematics is assumed.

The unit will introduce the fundamental concepts of three topics: (1) Renewable energy and storage systems, power conditioning, and electrical machines; (2) Power computations for single and three-phase AC systems; (3) Semiconductor technologies and nonlinear devices. The practical component of this unit includes computer simulation, implementation, and analysis of simple electrical circuits.

This unit uses problem/team-based learning approach. The concepts studied in this unit, and the knowledge and skills gained, will be used in multiple areas of electrical, electronics and mechatronics engineering.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Distinguish the main technical features of electrical and electronic technologies used in renewable energy and storage, electrical transportation, robotics and autonomous systems

ULO2: Identify operational characteristics of typical power converters and electrical machines for a range of industrial applications

ULO3: Demonstrate fundamental knowledge in power computations in AC systems

ULO4: Explain the working principles of key nonlinear devices such as transistors and power semiconductors

ULO5: Design, simulate, and perform hardware evaluation of circuits with one or more nonlinear components

General Assessment Information

Grading and passing requirement for unit: In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD). For further details about grading, please refer below in the policies and procedures section. There are no hurdles.

There will be *NO PRACTICAL CLASSES in week 1*. On-campus activities commence in week 1. If you are unable to return to campus for the start of session, contact Dr David Payne immediately.

Late Assessment Submission Penalty

Students will have the following university standard late penalty applied. Please see https://students.mq.edu.au/study/assessment-exams/assessments

Unless a Special Consideration request has been submitted and approved, a 10% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Assessments where Late Submissions will be accepted

In this unit, late submissions will be accepted as follows:

- Post-class online Quizzes (Take-home assignment) - YES, standard late penalty applies.
- Laboratory - YES, standard late penalty applies.
- Pre-classroom online quiz - NO, unless special consideration is granted.

Supplementary Exams: Supplimentary exams will be conducted in accordance with the University's policy. Please see Special Consideration - Eligibility | MQ Sydney

Assessment Tasks

Name	Weighting	Hurdle	Due
Pre-class online quizzes	10%	No	Weekly from Week 2 to Week 11
Practical Labs	25%	No	Week 2, 3, 5, 6, 8, 9, 11, 12 (see iLearn)
Post-class online quizzes	30%	No	Week 5, 8, 10, 13 (see iLearn)
Final Examination	35%	No	Exam Period

Pre-class online quizzes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 5 hours
Due: **Weekly from Week 2 to Week 11**
Weighting: **10%**

Students are expected to go through the online learning content, understand the theory and attempt the online quiz (on iLearn) each week before attending the classroom activities of that week.

On successful completion you will be able to:

- Distinguish the main technical features of electrical and electronic technologies used in renewable energy and storage, electrical transportation, robotics and autonomous systems
- Identify operational characteristics of typical power converters and electrical machines for a range of industrial applications
- Demonstrate fundamental knowledge in power computations in AC systems
- Explain the working principles of key nonlinear devices such as transistors and power semiconductors
- Design, simulate, and perform hardware evaluation of circuits with one or more nonlinear

components

Practical Labs

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 24 hours
Due: **Week 2, 3, 5, 6, 8, 9, 11, 12 (see iLearn)**
Weighting: **25%**

The laboratories are strongly recommended; attendance, participation, and completion of all the laboratory activities are required in order to satisfactorily complete the course. Students are required to record all the laboratory results for each experiment.

On successful completion you will be able to:

- Distinguish the main technical features of electrical and electronic technologies used in renewable energy and storage, electrical transportation, robotics and autonomous systems
- Identify operational characteristics of typical power converters and electrical machines for a range of industrial applications
- Demonstrate fundamental knowledge in power computations in AC systems
- Explain the working principles of key nonlinear devices such as transistors and power semiconductors
- Design, simulate, and perform hardware evaluation of circuits with one or more nonlinear components

Post-class online quizzes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 16 hours
Due: **Week 5, 8, 10, 13 (see iLearn)**
Weighting: **30%**

A series of open-book tests and short problems conducted via iLearn, to ascertain the student progress after the lecture material has been delivered (post-class).

On successful completion you will be able to:

- Distinguish the main technical features of electrical and electronic technologies used in

renewable energy and storage, electrical transportation, robotics and autonomous systems
- Identify operational characteristics of typical power converters and electrical machines for a range of industrial applications
- Demonstrate fundamental knowledge in power computations in AC systems
- Explain the working principles of key nonlinear devices such as transistors and power semiconductors

Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 18 hours
Due: **Exam Period**
Weighting: **35%**

The final exam will cover all the unit content, unless otherwise specified. This exam will involve short answers and problem solving and it will be an open-book exam.

On successful completion you will be able to:
- Distinguish the main technical features of electrical and electronic technologies used in renewable energy and storage, electrical transportation, robotics and autonomous systems
- Identify operational characteristics of typical power converters and electrical machines for a range of industrial applications
- Demonstrate fundamental knowledge in power computations in AC systems
- Explain the working principles of key nonlinear devices such as transistors and power semiconductors
- Design, simulate, and perform hardware evaluation of circuits with one or more nonlinear components

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[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Classroom activities (lectures) will start in week 1. There will be *NO PRACTICAL CLASSES* in week 1.

Recommended texts:

- Sedra, A. S., & Smith, K. C. (2015). Microelectronic circuits (International seventh edition.). New York: Oxford University Press.
- Glover, J. D., Overbye, T. J., & Sarma, M. S. (2017). Power system analysis & design (Sixth edition). Boston, MA: Cengage Learning.
- Mohan, N. (2012). Power electronics: a first course. Hoboken, N.J: Wiley

Technology and Software:

All the learning and assessment resources will be made available on iLearn. Classroom recordings will be available via Echo360.

Practical work in part one (weeks 2-7) will be carried out using portable electronics kits which include necessary components and an Analog Discovery 2 lab. LTSPICE software will be used for circuit simulation.

You will need a logbook (either digital or a bound notebook only for this purpose and no loose sheets) for the lab.

You will need a calculator for various numerical exercises throughout the session. **Note that only calculators with no text-recall function are permitted for the final exam**.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

A detailed schedule is available on the iLearn page. Classroom activity will start in week1. Note that there will be ***NO PRACTICAL CLASSES in week 1*** *(practical classes start from week 2).*

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure

- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Engineers Australia (EA) Competency Standards Mapping

EA Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	ULO1, ULO2, ULO3
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	ULO2, ULO3, ULO4
	1.3 In-depth understanding of specialist bodies of knowledge	ULO1, ULO2, ULO3, ULO5
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	ULO1, ULO5

	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	ULO1, ULO3, ULO4, ULO5
	2.2 Fluent application of engineering techniques, tools and resources.	ULO1, ULO2, ULO3, ULO4, ULO5
	2.3 Application of systematic engineering synthesis and design processes.	ULO1, ULO5
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	ULO2, ULO5
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	
	3.2 Effective oral and written communication in professional and lay domains.	
	3.3 Creative, innovative and pro-active demeanour.	ULO2
	3.4 Professional use and management of information.	ULO1, ULO2
	3.5 Orderly management of self, and professional conduct.	
	3.6 Effective team membership and team leadership	

Unit information based on version 2024.01R of the Handbook