



# ELCT3006

## Electrical Machines

Session 2, In person-scheduled-weekday, North Ryde 2022

*School of Engineering*

### Contents

|   |    |
|---|----|
| <u>General Information</u>                    | 2  |
| <u>Learning Outcomes</u>                      | 3  |
| <u>General Assessment Information</u>         | 3  |
| <u>Assessment Tasks</u>                       | 4  |
| <u>Delivery and Resources</u>                 | 7  |
| <u>Unit Schedule</u>                          | 9  |
| <u>Policies and Procedures</u>                | 9  |
| <u>Engineers Australia Competency Mapping</u> | 11 |

#### Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

Unit convenor and teaching staff

Convenor/Lecturer

Foad Taghizadeh

[foad.taghizadeh@mq.edu.au](mailto:foad.taghizadeh@mq.edu.au)

Contact via Email

Room 124, 1st floor, 44 Waterloo Rd Macquarie Park

Thursday 2:00 PM - 4:00 PM

Tutor

Farzan Tahir

[farzan.tahir@mq.edu.au](mailto:farzan.tahir@mq.edu.au)

Contact via Email

Credit points

10

Prerequisites

(ELEC2070 or ELEC270) and (ELEC2005 or ELEC2075 or ELEC275) or (ELCT2005 or ELEC295))

Corequisites

Co-badged status

Unit description

This unit develops fundamental knowledge and skills in the area of electrical machines (motors, generators) and their applications in modern electrical systems. This unit will equip students with the knowledge and skills necessary for designing, analysing, controlling and selecting appropriate machines for various applications, and to operate them in a safe, efficient and economical manner. Topics include: modelling, efficiency analysis, dynamics, and pros/cons of DC machines (generator and motor - self and separately excited, PMDC), single and three-phase AC machines (Induction motor - squirrel-cage and wound rotor), synchronous machines, special machines (reluctance motor, stepper motor, brushless DC motor, etc). Applications will include electrical and hybrid electrical vehicles, renewable energy systems and high-speed drives.

## 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:** Identify operational characteristics of typical electrical machines for a range of industrial applications.

**ULO2:** Analyse and critically assess key aspects of DC and AC machines for a range of typical applications.

**ULO3:** Design, model and analyse a complete electrical machine application based on a set of specifications;

**ULO4:** Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communication.

## 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, or HD).
- For further details about grading, please refer below in the policies and procedures section.
- If you receive special consideration for the oral presentation and demonstration of the Project, a supplementary conventional exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the oral presentation and demonstration of the Project you are declaring yourself available for a conventional exam during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to applying. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

### Hurdle Requirements

- Students must attend and participate in at least **5 of the 6 weekly PC Labs** (Weeks 2-7) to pass this unit.
- Students must attend and participate in at least **5 of the 6 weekly Project Labs** (Weeks 8-13) to pass this unit.

### Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following university standard late penalty applied. Please see <https://students.mq.edu.au/study/assessment-exams/assessments> for more information.

Unless a Special Consideration request has been submitted and approved, a 5% 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 accepted as follows:

PC-Lab Assignment – YES, Standard Late Penalty applies

Pre-Class Quiz & Mid-Term Quiz - NO, unless Special Consideration is Granted

Project Assessment – NO, unless Special Consideration is Granted

## Assessment Tasks

| Name                               | Weighting | Hurdle | Due           |
|------------------------------------|-----------|--------|---------------|
| <u>Assessment (Project)</u>        | 60%       | No     | Weeks 13 & 14 |
| <u>Assignments (PC Labs)</u>       | 20%       | No     | Weeks 2-7     |
| <u>Pre-Class Quiz (Lectorials)</u> | 10%       | No     | Weeks 2-7     |
| <u>Class Quiz (Lectorials)</u>     | 10%       | No     | Week 8        |

### Assessment (Project)

Assessment Type <sup>1</sup>: Project

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **Weeks 13 & 14**

Weighting: **60%**

This is the major assessment of this Unit. It will consist of 3 individual assessments and 1 team assessment, as follows:

- Individual assessments:
  - Oral presentation and demonstration of the project;
  - Peer assessment regarding the actual contribution of each team member;

- Evaluation of project logbook of each team member.
- Team assessment:
  - Project report to be submitted in iLearn by each team.

On successful completion you will be able to:

- Identify operational characteristics of typical electrical machines for a range of industrial applications.
- Analyse and critically assess key aspects of DC and AC machines for a range of typical applications.
- Design, model and analyse a complete electrical machine application based on a set of specifications;
- Work effectively in teams by: identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communication.

## Assignments (PC Labs)

Assessment Type <sup>1</sup>: Lab book

Indicative Time on Task <sup>2</sup>: 12 hours

Due: **Weeks 2-7**

Weighting: **20%**

Evaluation of PC Lab activities and submission of a Lab book by the end of the semester. This evaluation focuses on students ability to perform analysis, modelling and implementation of typical electrical machines using simulation tools.

On successful completion you will be able to:

- Identify operational characteristics of typical electrical machines for a range of industrial applications.
- Analyse and critically assess key aspects of DC and AC machines for a range of typical applications.
- Design, model and analyse a complete electrical machine application based on a set of specifications;

## Pre-Class Quiz (Lectorials)

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Weeks 2-7**

Weighting: **10%**

Students are expected to go through the iLearn content, understand the theory and attempt the online quiz each week prior to participating in class activities of that week.

On successful completion you will be able to:

- Identify operational characteristics of typical electrical machines for a range of industrial applications.
- Analyse and critically assess key aspects of DC and AC machines for a range of typical applications.

## Class Quiz (Lectorials)

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Week 8**

Weighting: **10%**

A quiz is scheduled right after the mid-semester break. The quiz will assess both factual knowledge and problem solving.

On successful completion you will be able to:

- Identify operational characteristics of typical electrical machines for a range of industrial applications.
- Analyse and critically assess key aspects of DC and AC machines for a range of typical applications.

---

<sup>1</sup> 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.

<sup>2</sup> 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

## UNIT WEBSITE

- The iLearn website for this unit can be found at: <https://ilearn.mq.edu.au/login/>.
  - *Note! All information and communications relevant to this Unit will be via the iLearn website.*

## TEXTBOOK

- Recommended book: [Electric Machinery Fundamentals](#) (Digital or Print), 5th Edition, by Stephen J. Chapman, McGraw Hill Int., 2012, ISBN-978-0-07-352954-7 (Digital version recommended).
  - *Note! Links will be provided to specific sections of the Digital version in iLearn for each Lectorial.*
  - *Remark: All students are expected to have access to this textbook.*
  - Support Website: <http://www.mhhe.com/chapman>
- Supplementary book: [Electric Machines and Drives: A First Course](#) (2012), by Ned Mohan, Wiley, ISBN: 978-1-118-21529-6 (Digital version suggested).
  - *Note! This textbook comes accompanied with slide presentations and videos by the author, Prof. Ned Mohan.*

## LECTORIALS

- Lectorials take place twice a week (Weeks 1-7) according to the Unit schedule.
- Lectorials are a combination of traditional lecture and tutorial teaching modes and are designed to improve student engagement.
- The Lectorials are organised in a [flipped classroom fashion](#).
- Prior to Lectorials
  - links to E-Text specific sections, brief videos and/or lecture notes are posted in iLearn each week.
  - students are expected to read these E-Text sections, try to solve any given examples, and watch any videos and/or read any posted notes prior to attending the Lectorials.
  - 'pre-class' mini quizzes to assess the basic understanding of fundamental principles in electrical machines.
- During Lectorials
  - brief discussion sessions on fundamental principles.
  - plenty of practical examples.

- interactive problem solving involving students.

## LABORATORIES

- PC Lab activities take place once a week (Weeks 2-7) according to the Unit schedule.
  - *Note! Students must enrol in one of the available weekly Lab sessions.*
- Interactive PC Labs may use [LVSIM-EMS](#) software platform to assist with the Lab experiments.

## PROJECTS

- Project activities take place once a week (Weeks 8-13) according to the Unit schedule.
  - *Note! Teams must enrol in one of the available weekly Project sessions.*
- The team Project is the core component of this Unit. The Projects cover practical aspects of electrical machines.
- Students are required to form teams and work on the given project topic.
  - *Note! When forming teams, students should agree in which weekly Project session they want to enrol.*
  - *All Project activities are performed in teams;*

## TECHNOLOGY

- The laboratory work will rely on the use of FESTO equipment and/or [LVSIM-EMS](#) software platform.
  - The software platform is available through a Web browser and/or Faculty Lab PCs.
- The Project work will rely on the use of PLECS software platform.
  - PLECS Standalone software can be downloaded for free from [Plexim website](#) and/or or can be used on dedicated Lab PCs.

## COMMUNICATIONS

- Students are reminded the University will communicate all official notices by email to official MQ student's account. Students should read their @student.mq.edu.au email regularly or forward it to an account they check regularly.
- All announcements and other communications regarding this Unit will be via iLearn platform.

## WEB RESOURCES

- [LVSIM-EMS](#)
  - <https://lvsim.labvolt.com/>
- [PLECS support:](#)



- <https://plexim.com/support>
  - [PLECS videos](#)
  - [Application examples](#)
  - [Technical solutions](#)
  - [Installation help](#)

**NOTE!** On campus activities may be subject to change depending on restrictions relating to COVID19.

## Unit Schedule

For details, please refer to the Unit Schedule on the ELCT3006 iLearn webpage.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://policies.mq.edu.au) (<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) (<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) (<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](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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 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/](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 Competency 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, ULO4 |
|                                      | 1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.                                     | ULO1, ULO2, ULO3, ULO4 |
|                                      | 1.3 In-depth understanding of specialist bodies of knowledge   | ULO1, ULO2, ULO3, ULO4 |
|                                      | 1.4 Discernment of knowledge development and research directions   | ULO1, ULO2, ULO3, ULO4 |
|                                      | 1.5 Knowledge of engineering design practice   | ULO3, ULO4             |
|                                      | 1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.                     | ULO1, ULO2, ULO3       |
| Engineering Application Ability      | 2.1 Application of established engineering methods to complex problem solving  | ULO3, ULO4             |
|                                      | 2.2 Fluent application of engineering techniques, tools and resources.   | ULO1, ULO2, ULO3, ULO4 |
|                                      | 2.3 Application of systematic engineering synthesis and design processes.  | ULO1, ULO2, ULO3, ULO4 |
|                                      | 2.4 Application of systematic approaches to the conduct and management of engineering projects.                          | ULO4                   |
| Professional and Personal Attributes | 3.1 Ethical conduct and professional accountability.   | ULO4                   |
|                                      | 3.2 Effective oral and written communication in professional and lay domains.  | ULO4                   |
|                                      | 3.3 Creative, innovative and pro-active demeanour.   | ULO1, ULO2, ULO3, ULO4 |
|                                      | 3.4 Professional use and management of information.  | ULO1, ULO2, ULO3       |
|                                      | 3.5 Orderly management of self, and professional conduct.  | ULO4                   |

| EA Competency Standard |   | Unit Learning Outcomes |
|------------------------|---|------------------------|
|                        | 3.6 Effective team membership and team leadership | ULO4                   |