PHYS1520

Physics for Electrical and Electronic Engineering

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Mathematical and Physical Sciences

Contents

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General Information

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Credit points
10

Prerequisites
PHYS1510

Corequisites

Co-badged status

Unit description
This unit, following on from PHYS1510 completes the overview of electric and magnetic physics required for further study in electrical and electronic engineering disciplines. We complete the theory of electromagnetism, studying fields, potentials, the origin and effects of magnetic fields and electromagnetic induction, all described by Maxwell's equations. We link this physics to the fundamental quantities used in circuit theory: emf, voltage, current, resistance, capacitance, and inductance. We develop the language and toolkit used to design and analyse simple circuits, including the circuit theorems and circuit analysis techniques, and provide an introduction to electromagnetic radiation (light). Laboratory sessions provide a practical context for students to consolidate key concepts via conducting experiments and carrying out open ended exploration of basic circuits.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Quality Education; Affordable and Clean Energy; Industry, Innovation and Infrastructure

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: explain foundational concepts in electricity and magnetism, and describe them in terms of concise mathematical models.

ULO2: analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.

ULO3: perform and report on laboratory experiments using a broad range of equipment, with an increased sophistication in treatment of errors.

ULO4: build and model simple electrical circuits and measure circuit properties with a digital multi-meter.

ULO5: clearly explain physics concepts learned and illustrate these to peers.

ULO6: demonstrate foundational learning skills including active engagement in your learning process

General Assessment Information

Requirements to Pass this Unit

To pass this unit you need to achieve a total mark equal to or greater than 50% across all assessments.The three assessments for the unit are as follows:

LABORATORY WORK (30%, estimated time on task = 10 hours outside of scheduled classes)

Laboratory work entails hands-on practical activities that are undertaken during scheduled laboratory classes. There is a ***online*** *induction module and safety quiz* that needs to be completed in ***Week 1.*** It contains important work health and safety information. Students will also need to enrol in groups on iLearn so as to know which experiment to prepare for and complete in week 2. Lab books will be handed out in week 2. **It is mandatory to complete the online module – *you cannot do subsequent lab sessions until you do.***

The next *nine* lab sessions involve experimental work and will be assessed. Preparation is required for each of these lab sessions and you will find the Prelab activities in the Laboratory Resources section of iLearn.

All laboratory work will be documented in the lab book provided to you. The teaching staff will assist you throughout each lab session, providing feedback, allocating “points” for pre-lab work, for demonstrating particular skills during class, and for the documentation in your lab book. The points will be recorded in your lab book after each class so that you can track your progress. You can earn up to 20 “points” for your work each lab session, and your final mark for the Laboratory work will be determined from these points. To achieve full marks you would need to attend all lab sessions and achieve 20 points in all nine practical lab sessions. Your laboratory work accounts for 30% of your final mark for the unit.

A limited number of catch-up labs will be offered for students who miss a lab session. These will be held during the mid-session break, and towards the end of semester. A student can request ***no more than three*** catch up labs, via an online form on iLearn. Further details will be made available in the Lab Resources section of iLearn and during the first Lab session.

VIVA/ORAL EXAMINATION: (30%, estimated time on task = 15 hours)

This assessment task relates to your understanding of Electric Circuit Analysis. It will involve students demonstrating their knowledge and the application of their knowledge in fundamental circuit analysis and will address the various themes and techniques covered in the electric circuits part of the unit.

The assessment will be via an oral demonstration or explanation addressing 4-5 of these themes. Each theme in the assessment will be of equal mark value and students will be expected to spend a total of 20-30 minutes with their oral explanation.

Each theme will be accompanied by a relevant circuit question, provided shortly prior to the oral explanation. This will provide students with an opportunity to think about and plan the explanation. Students will be able to generate a brief written solution or explanation to support the oral assessment.

The oral assessment will be completed in scheduled class time during week 13. Students will however also have an opportunity to distribute the oral assessment by having individual themes assessed earlier than week 13 during the electric circuits scheduled class time.

Further details on the logistics of the oral assessment will be available within iLearn.

FINAL WRITTEN EXAMINATION: (30%, estimated time on task = 15 hours)

This assessment task relates to your understanding of Electromagnetism and Modern Physics. It will be a closed-book, on-campus exam of duration 2 hours.

If you receive special consideration for the final exam, a supplementary exam will be scheduled after results are released. Please see FSE101 in iLearn for dates. By making a special consideration application for the final exam you are declaring yourself available for a resit 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 submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Attendance and Participation

We strongly encourage all students to actively participate in all learning activities. Regular engagement is crucial for your success in this unit, as these activities provide opportunities to deepen your understanding of the material, collaborate with peers, and receive valuable feedback from instructors, to assist in completing the unit assessments. Your active participation not only enhances your own learning experience but also contributes to a vibrant and dynamic learning environment for everyone.

Late Assessment Submission Late assessments are not accepted in this unit unless a Special Consideration has been submitted and approved.

Special Consideration The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through https://connect.mq.edu.au..

Assessment Tasks

Name	Weighting	Hurdle	Due
Lab book	30%	No	At the end of last lab class
Oral Examination	30%	No	Week 13
Written examination	40%	No	During formal examination period

Lab book

Assessment Type [1]: Lab book
Indicative Time on Task [2]: 10 hours
Due: **At the end of last lab class**
Weighting: **30%**

Assessment of in-lab record of experimental activities, as well as any pre-lab work.

On successful completion you will be able to:

- perform and report on laboratory experiments using a broad range of equipment, with an increased sophistication in treatment of errors.
- build and model simple electrical circuits and measure circuit properties with a digital multi-meter.
- clearly explain physics concepts learned and illustrate these to peers.

Oral Examination

Assessment Type [1]: Viva/oral examination
Indicative Time on Task [2]: 15 hours
Due: **Week 13**
Weighting: **30%**

Students present/discuss their approach to solving a selection of Circuit Analysis problems.

On successful completion you will be able to:

- explain foundational concepts in electricity and magnetism, and describe them in terms of concise mathematical models.
- analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.
- demonstrate foundational learning skills including active engagement in your learning process

Written examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 25 hours
Due: **During formal examination period**
Weighting: **40%**

Written Examination in the university exam period, covering the content from the "Electromagnetism and Modern Physics" part of the unit.

On successful completion you will be able to:

- explain foundational concepts in electricity and magnetism, and describe them in terms of concise mathematical models.
- analyse linear electrical circuits through the use of appropriate models including circuit simplifications, mesh and node analysis, and equivalent circuits.

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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

Week 1 classes:

Lectures and SGTAs commence in Week 1. There are online tasks in Week 1 for the Lab Program, and on-campus labs commence in Week 2. Please see the details in iLearn.

Methods of Communication We will communicate with you via your university email and through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to the unit convenor via the contact email on iLearn.

General Information Important instructions and study materials are hosted on the iLearn webpage for the unit as are all announcements. You will find it at http://ilearn.mq.edu.au Please refer to it frequently!

Asking for help

A number of people can assist students while they undertake PHYS1520. For any inquiry please use this e-mail address: **PHYS1520@mq.edu.au** instead of using people's personal e-mails. This will ensure that the best answer to your question is obtained.

Unit textbook. The textbook for most of this unit is "***Fundamentals of Physics***" by Halliday. Resnick and Walker,11th edition. It is essential that you arrange access (digital or physical) to this textbook (10th edition is sufficient) as we will be following it closely and you will find it an invaluable resource. This is the same textbook that you used for PHYS1510. Print versions or digital options are available through https://www.wiley.com/en-au/Halliday's+Fundamentals+of+Physics%2C+1st+Australian+&+New+Zealand+Edition-p-9780730382867 ***The Library has an unlimited license to Fundamentals Of Physics Extended 10th Edition***. Access the book online from the library by using multisearch, or look for the link on iLearn.

The second textbook that you will find useful for the portion of this unit that delves into Electric Circuits is ***Introduction to Electric Circuits*** by Dorf and Svoboda The text book will also be a useful resource for further Engineering study in Electronics, Electrical, and Mechatronics

Engineering. ***The Library also has a license to this book,*** or you can purchase the e-text from here: https://www.wiley.com/en-au/Dorf%27s+Introduction+to+Electric+Circuits%2C+Global+Edition-p-9781119456162

Technology: Audio recordings and copies of slides from lectures will be available on iLearn. These are intended as backups, and are definitely not a substitute for attending lectures in person.

The use of calculators in the laboratory classes, SGTAs, assignments and in the final examination for this unit is usually necessary. In accordance with the Science & Engineering Faculty's policy, calculators with a full alphabet on the keyboard are not allowed in the final examination. Personal electronic devices such as smartphones, tablets, or laptops will be used for self-assessment quizzes and other learning enhancement classroom activities.

Lectures, SGTAs, and Lab classes

This unit consists of three different formal types of activity, all of which are scheduled for on-campus delivery. There are no online classes. If there are any changes to the delivery, you will be notified via iLearn announcements.

1) LECTURES

In lectures, new material is presented, discussed and illustrated by examples and demonstrations. Lectures are an important part of studying physics, where the lecturers seek to explain the concepts from several points of view, point out and explain the most important aspects of the material and, very importantly, illustrate the relationships and connections between the different concepts that are studied in PHYS1520 – no subject in physics stands on its own. Problem solving is modelled via worked examples and these scaffold the more complex problems considered in the SGTA.

2) SGTA classes

These classes are where you will consolidate and apply the concepts and methods taught in lectures, to solving problems. There will be a mix of activities such as demonstrations, informal quizzes and presentations, solving set problems, and past exam questions. SGTAs form an important learning component of PHYS1520.

3) LABORATORY SESSIONS

The laboratory component is an essential component of your studies and so counts for an appreciable fraction of your final assessment. You will be introduced to some of the basic skills and techniques required of practicing physicists, scientists and engineers. **You will be issued with a Laboratory Notebook,** provided with instructional material in the form of **Laboratory Notes** which can be found in the Laboratory Resources section of iLearn, and assisted in the laboratory by a team of demonstrators. For each laboratory session you are required to complete some preparatory work (**Pre-Lab**) before attending your nominated Lab session. To figure out which Prelab to do, please consult the **Laboratory Schedule** on iLearn.

Location: There are two laboratories used for 1st year physics they are both in **14 SCO (formerly E7B):**

Room 114 (Ground floor at the North-East corner of building)

Room 254 (First floor, north-facing side of the atrium)

Please check iLearn to see where your lab class will take place.

Laboratory Safety: You are required to follow all safety guidelines given in the first Lab session, your lab notes, and the lab staff. Food and drink cannot be consumed in the lab, and students without suitable covered footwear will be refused admission.

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 connect.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 the Service Connect Portal, 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.

Changes from Previous Offering

To enable students more time to focus on learning, understanding and reflecting on the content of our unit we have revised the assessment structure as follows. There are now only three assessments: your lab book, a Viva/Oral examination that relates to your understanding of Electric Circuit Analysis, and a Final Exam (written) that relates to your understanding of Electromagnetism and Modern Physics. Although no marks are associated with attendance, all activities provide you with key content designed to help you understand content and complete the assessments.

Unit information based on version 2025.04 of the Handbook