ELEC2070

Linear Circuits and Devices

Session 1, Weekday attendance, North Ryde 2021

School of Engineering

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Convenor
Stuart Jackson
stuart.jackson@mq.edu.au
Contact via 9850 9137
Rm 315, 9 Wallys Walk
Tuesdays 3 - 5 pm

Credit points
10

Prerequisites
(PHYS1520 or PHYS143 or ENGG150) and (MATH1020 or MATH1025 or MATH136 or MATH133)

Corequisites

Co-badged status

Unit description
This unit develops the fundamentals in electric and electronic circuits and the laboratory investigation and reporting. The unit covers the key electric circuit elements and their models, and analysing circuits including these models. Topics include: linear electrical components; energy dissipation, energy storage and power transfer; Kirchhoff's laws; transient versus steady-state. Linear electrical components include voltage and current sources, resistors, capacitors, and inductors. Time domain vs frequency domain circuit analysis, and impedance concept is introduced, leading to ac circuit analysis and ac power concepts.

Important Academic Dates

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

Learning Outcomes

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

ULO1: Calculate the response of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power.
ULO2: Apply the method of time domain analysis of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power

when an abrupt change is applied to the circuit.

ULO3: Analyse circuits composed of linear circuit elements with a source of energy with a sinusoidal time dependence to determine the circuit's response in terms of current, voltage and power.

ULO4: Apply the method of frequency domain analysis and the Laplace Transform to determine the circuit response for all applied frequencies.

ULO5: Physically construct and experimentally characterise circuits with one or more linear components

ULO6: Write concise reports summarising methodologies used and the results obtained.

General Assessment Information

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Weekly Plan

A weekly plan of lectures, assignments, tests, laboratory and workshop sessions will be posted on iLearn. Students are expected to consult it and be aware of possible minor variations.

Assignment Tasks

Assignment questions will be posted on iLearn at least two weeks before their submission date. Assignment solutions will be posted within one to three days after the submission date. Submissions will not be accepted after the due date. All assignments must be submitted electronically through iLearn (in pdf format). Submissions are expected to be neatly written (or typed) in a logical layout and sequence. Markers WILL NOT grade poorly organised or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams. Re-submissions will be permitted up to the original due date. All assignments should be prepared individually by you. It is expected that students consult tutors, lecturers or other students while learning the concepts, but copying assignments from others is not accepted. Students are expected to have read and understood the academic honesty policy.

Late submissions

Late submissions of assignments or absences from laboratories will not be accepted without prior arrangement made at least one week before the submission date. Extenuating circumstances will be considered upon lodgment of a formal notice of disruption of studies.

Grading

In order to pass this unit a student must obtain a mark of 50 or more overall or obtain a passing grade P / CR / D / HD.

Supplementary Exam

If you receive special consideration for the final exam, a supplementary exam will be scheduled. 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.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	3%	No	14/3/2021
Assignment 2	3%	No	18/4/2021
Assignment 3	3%	No	9/5/2021
Assignment 4	3%	No	30/5/2021
Test 1	5%	No	10/3/2021
Test 2	5%	No	21/4/2021
Test 3	5%	No	19/5/2021
Practical laboratories	23%	No	Week 2 to Week 13
Final Exam	50%	No	TBA

Assignment 1

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 16 hours
Due: **14/3/2021**
Weighting: **3%**

This is a take home activity

On successful completion you will be able to:

- Calculate the response of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power.

Assignment 2

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 16 hours
Due: **18/4/2021**
Weighting: **3%**

This is a take home activity

On successful completion you will be able to:

- Apply the method of time domain analysis of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power when an abrupt change is applied to the circuit.

Assignment 3

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 16 hours
Due: **9/5/2021**
Weighting: **3%**

This is a take home activity

On successful completion you will be able to:

- Analyse circuits composed of linear circuit elements with a source of energy with a sinusoidal time dependence to determine the circuit's response in terms of current, voltage and power.

Assignment 4

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 16 hours
Due: **30/5/2021**
Weighting: **3%**

This is a take home activity

On successful completion you will be able to:

- Apply the method of frequency domain analysis and the Laplace Transform to determine the circuit response for all applied frequencies.

Test 1

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **10/3/2021**
Weighting: **5%**

20 minute test

On successful completion you will be able to:

- Calculate the response of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power.

Test 2

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **21/4/2021**
Weighting: **5%**

20 minute test

On successful completion you will be able to:

- Apply the method of time domain analysis of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power when an abrupt change is applied to the circuit.

Test 3

Assessment Type [1]: Quiz/Test

Indicative Time on Task [2]: 2 hours
Due: **19/5/2021**
Weighting: **5%**

20 minute test

On successful completion you will be able to:

- Analyse circuits composed of linear circuit elements with a source of energy with a sinusoidal time dependence to determine the circuit's response in terms of current, voltage and power.

Practical laboratories

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 12 hours
Due: **Week 2 to Week 13**
Weighting: **23%**

These are carried weekly from Week 2 onwards

On successful completion you will be able to:

- Calculate the response of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power.
- Apply the method of time domain analysis of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power when an abrupt change is applied to the circuit.
- Analyse circuits composed of linear circuit elements with a source of energy with a sinusoidal time dependence to determine the circuit's response in terms of current, voltage and power.
- Apply the method of frequency domain analysis and the Laplace Transform to determine the circuit response for all applied frequencies.
- Physically construct and experimentally characterise circuits with one or more linear components
- Write concise reports summarising methodologies used and the results obtained.

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 6 hours
Due: **TBA**
Weighting: **50%**

End of session final examination. This is not a hurdle.

On successful completion you will be able to:

- Calculate the response of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power.
- Apply the method of time domain analysis of circuits composed of linear circuit elements with a source of constant energy to determine all currents, voltages and power when an abrupt change is applied to the circuit.
- Analyse circuits composed of linear circuit elements with a source of energy with a sinusoidal time dependence to determine the circuit's response in terms of current, voltage and power.
- Apply the method of frequency domain analysis and the Laplace Transform to determine the circuit response for all applied frequencies.
- Physically construct and experimentally characterise circuits with one or more linear components
- Write concise reports summarising methodologies used and the results obtained.

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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 Learning Skills Unit 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

The unit will comprise of 12 lectures + Exam revision lecture in Week 13 with all the review material placed on iLearn.

Textbooks

PRIMARY TEXT:

J. A. Svoboda, R. C. Dorf, “Introduction to Electric Circuits 9th edition,” Wiley, 2014 (or 8th edition)

SECONDARY TEXTS:

W. H. Hayt, J. E. Kennedy, S. M. Durbin, "Engineering Circuit Analysis," McGraw Hill 2007 (8th edition)

A. R. Hambley, “Electrical Engineering, Principles and Applications, International Sixth Edition,” Pearson, 2014.

Required unit materials: • The textbook J. A. Svoboda, R. C. Dorf, “Introduction to Electric Circuits 9th edition,” is the primary text. Hayt can be used to supplement the unit. • Lecture notes and worksheets for laboratory sessions (available from iLearn) • Bound logbook for all practical sessions

Technology used: Typical electronic and electrical laboratory instruments such as voltage and current sources, voltmeters, ammeters, oscilloscopes, simulation software such as MATLAB and LT Spice will be used.

Unit Schedule

Introduction and Review of Thévenin and Norton circuits. Maximum available power.

Energy Storage

The Operational Amplifier

Complete Response: First and second order circuits

Steady state sinusoidal analysis. Concept of impedance.

AC circuit analysis. AC Thévenin and Norton circuits

Complex power: Maximum available, average power

Time domain vs frequency domain. Frequency response. Simple filters.

The Laplace Transform

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
- Grade Appeal Policy
- Complaint Management 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

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise
- 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 Enquiry Service

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

Equity Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

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.