UNSW Course Outline

ZEIT2207 Analog Electronics - 2024

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General Course Information

Course Code : ZEIT2207
Year : 2024
Term : Semester 1
Teaching Period : Z1
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Engineering and Technology
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course focuses on the analysis, design, and construction of analog electronic circuits, including semiconductor devices such as diodes and transistors. Circuit analysis via the Laplace transform will also be introduced to analyse frequency-dependent circuits. This course builds upon the development of the DC and AC circuit analysis techniques introduced in Electrical

Circuits, as well as on skills developed in Mathematics 1B and 2A. This course will cover the principles of semiconductors, pn junctions and diodes, the principles of transistors, biasing of transistors, transistor amplifiers, small-signal models, the Laplace transform, circuit analysis based on the Laplace transform, and frequency-selective circuits (analog filters).

Relationship to Other Courses

The prerequisites: ZEIT1206 Electrical Circuits, and ZPEM1304 Mathematics 1B.

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Engineering Technologist (Stage 1), Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Analyse circuits including diodes and transistors using DC large-signal models.	• ET2.2 : Application of engineering techniques, tools and resources within the technology domain • ET3.1 : Ethical conduct and professional accountability • ET3.4 : Professional use and management of information • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO2 : Perform DC biasing of transistor circuits, and analyse and design transistor amplifiers.	• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET2.1 : Application of established engineering methods to broadly-defined problem solving within the technology domain • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO3 : Perform small-signal analysis of circuits containing transistors.	• ET2.2 : Application of engineering techniques, tools and resources within the technology domain • ET2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and

	physical sciences and the engineering fundamentals applicable to the engineering discipline
CLO4 : Solve linear circuits using the Laplace transform.	• ET1.2 : Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain • PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO5 : Calculate and design transfer functions of frequency-selective circuits (analog filters) using the Laplace transform.	• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE3.2 : Effective oral and written communication in professional and lay domains

Course Learning Outcomes	Assessment Item
CLO1 : Analyse circuits including diodes and transistors using DC large-signal models.	
CLO2 : Perform DC biasing of transistor circuits, and analyse and design transistor amplifiers.	
CLO3 : Perform small-signal analysis of circuits containing transistors.	
CLO4 : Solve linear circuits using the Laplace transform.	
CLO5 : Calculate and design transfer functions of frequency-selective circuits (analog filters) using the Laplace transform.	

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

The laboratory exercises are designed to assist learning by emphasising the practical aspects of circuit analysis and design. This complements the theory-based approach used in the lectures and tutorials. The laboratory activities are timed such that students may see an aspect of a circuit before it is explained by theory in the lectures: this exploratory approach to learning circuit design develops deep understanding of the underlying electrical principles. You are required to use a logbook or equivalent to record all your analysis, design, simulation, and measurement results related to your laboratory work.

The laboratory activities are designed to build on one another, and the logbook is intended to be used to clearly document each activity, and the steps you have taken in the design of your circuits. This approach models good experimental practice in science and engineering.

The Learning Management System

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the Moodle Support page.

UNSW Moodle supports the following web browsers:

» Google Chrome 50+
» Safari 10+
** Internet Explorer is not recommended

** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad IOS10

For further details about system requirements click here.

Log in to Moodle here.

If you need further assistance with Moodle:

For enrolment and login issues please contact:
IT Service Centre
Email: itservicecentre@unsw.edu.au
Phone: (02) 9385-1333
International: +61 2 9385 1333

For all other Moodle issues please contact:
External TELT Support
Email: externalteltsupport@unsw.edu.au
Phone: (02) 9385-3331
International: +61 2 938 53331

Opening hours:
Monday – Friday 7:30am – 9:30 pm
Saturday & Sunday 8:30 am – 4:30pm

Other Professional Outcomes

Students will be able to relate a quantitative, theory-based understanding of the sciences and fundamentals of electrical engineering (encompassing circuit analysis and design, signal processing, dynamical systems, control, power systems and communications). Also, they will demonstrate a comprehensive understanding of electrical systems and components, and articulate directions of future research and knowledge development in electrical engineering.

Additional Course Information

This course will cover the principles of semiconductors, pn junctions and diodes, the principles of transistors, biasing of transistors, transistor amplifiers, small-signal models, the Laplace transform, circuit analysis based on the Laplace transform, and frequency-selective circuits (analog filters).

Referencing

In this course, students are required to reference following the APA 7 / Chicago NB referencing style. Information about referencing styles is available at: https://guides.lib.unsw.adfa.edu.au/

c.php?g=472948&p=3246720

Study at UNSW Canberra

https://www.unsw.adfa.edu.au/study

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

Additional Information as required

CRICOS Provider no. 00098G

The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Engineers Australia - Engineering Technologist (Stage 1), Engineers Australia - Professional Engineer (Stage 1)
Class Tests (x2) Assessment Format: Individual	20%	Start Date: During the lecture slot 18 March and 6 May Due Date: in 50 min after opening the test papers	• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET3.2 : Effective oral and written communication in professional and lay domains • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving
Lab Reports (x3) Assessment Format: Individual	45%	Start Date: 26/02/2024 12:00 AM Due Date: Each lab has its deadline according to the course schedule available on Moodle	• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.3 : In-depth understanding of specialist bodies of knowledge within the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors

			impacting the technology domain • ET2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE3.2 : Effective oral and written communication in professional and lay domains
Final Exam Assessment Format: Individual	35%	Start Date: During exam week Due Date: after 3 hours of opening the exam papers	• ET1.1 : Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain • ET1.5 : Knowledge of engineering design practice and contextual factors impacting the technology domain • ET3.2 : Effective oral and written communication in professional and lay domains • ET3.5 : Orderly management of self, and professional conduct • PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist

			bodies of knowledge within the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE3.1 : Ethical conduct and professional accountability • PEE3.5 : Orderly management of self, and professional conduct

Assessment Details

Class Tests (x2)

Assessment Overview

Two Class Tests, worth 10% each

Detailed Assessment Description

There will be two Class Tests during the lecture slot for 1 hour

Class Test 1 - 18 March

Class Test 2 - 6 May

Assessment Length

1 hour

Submission notes

personal hand-in

Assignment submission Turnitin type

Not Applicable

Lab Reports (x3)

Assessment Overview

Three separate Lab Reports, worth 15% each

Detailed Assessment Description

There will be 3 Lab reports covering all topics: 1) Semiconductor, 2) Amplifiers, and 3) Filters

Assessment Length

3 to 4 weeks

Submission notes

submitted by due date via Moodle.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Final Exam

Assessment Overview

n/a

Detailed Assessment Description

The Final Exam during the exam week

Assessment Length

3 hours

Submission notes

personal hand-in

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Students will get the written feedback of Assignment 1 (Class Test 1) by the census date (24 March).

Late Submission of Assessment

Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.

Use of Generative AI in Assessments

Simple Editing Assistance - Students are permitted to use standard editing and referencing

software, but not Generative AI.

You are permitted to use the full capabilities of the standard software to answer the question (e.g. you may wish to specify particular software such as Microsoft Office suite, Grammarly, etc.).

If the use of generative AI such as ChatGPT is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

In order to pass the course, students must achieve an overall mark of 50% in the course assessment.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Lecture	Introduction of semiconductors and pn-junction Andrey Miroshnichenko
	Tutorial	Introduction of semiconductors and pn-junction Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 1 Andrey Miroshnichenko and Khalil As'ham
Week 2 : 4 March - 8 March	Lecture	Diodes Andrey Miroshnichenko
	Tutorial	Diodes Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 1 Andrey Miroshnichenko and Khalil As'ham
Week 3 : 11 March - 15 March	Tutorial	Diodes Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 1 Andrey Miroshnichenko and Khalil As'ham
Week 4 : 18 March - 22 March	Lecture	Bipolar junction transistor Andrey Miroshnichenko
	Assessment	Class Test 1 during the lecture slot.
	Lecture	Bipolar junction transistor - during tute slot Andrey Miroshnichenko
	Laboratory	Lab 1 Andrey Miroshnichenko and Khalil As'ham
Week 5 : 25 March - 29 March	Lecture	MOS field-effect transistor Andrey Miroshichenko
	Tutorial	MOS field-effect transistor Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham
	Assessment	Lab 1 report is due
Week 6 : 1 April - 5 April	Tutorial	BJTs and FETs Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham
Week 7 : 22 April - 26 April	Lecture	Biasing of transistor circuits Andrey Miroshnichenko
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham
Week 8 : 29 April - 3 May	Lecture	Amplifiers and two-port networks Andrey Miroshnichenko
	Tutorial	Amplifiers and two-port networks Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham
Week 9 : 6 May - 10 May	Lecture	BJT amplifiers and small-signal analysis Andrey Miroshnichenko
	Assessment	Class Test 2 during the lecture slot.
	Lecture	BJT amplifiers and small-signal analysis - during tute sot Andrey Miroshnichenko
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham
Week 10 : 13 May - 17 May	Lecture	Common emitter and common collector BJT amplifiers Andrey Miroshnichenko
	Tutorial	Common emitter and common collector BJT amplifiers Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 2 Andrey Miroshnichenko and Khalil As'ham

Week 11 : 20 May - 24 May	Lecture	Introduction of Laplace transform Andrey Miroshnichenko
	Tutorial	Introduction of Laplace transform Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 3 Andrey Miroshnichenko and Khalil As'ham
	Assessment	Lab 2 report is due
Week 12 : 27 May - 31 May	Lecture	Laplace transform in circuit analysis Andrey Miroshnichenko
	Tutorial	Laplace transform in circuit analysis Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 3 Andrey Miroshnichenko and Khalil As'ham
Week 13 : 3 June - 7 June	Lecture	Frequency selective circuits Andrey Miroshnichenko
	Tutorial	Frequency selective circuits Andrey Miroshnichenko and Khalil As'ham
	Laboratory	Lab 3 Andrey Miroshnichenko and Khalil As'ham
	Assessment	Lab 3 report is due

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

There is 1 two-hour lecture, 1 one-hour tutorial and 1 three-hour lab per week.

Course Resources

Prescribed Resources

1) J. W. Nilsson and S. Riedel, “Electric Circuits,” 11th Edition, Pearson, 2018;

2) Sedra and Smith. “Microelectronic Circuits,” 8th Edition, Oxford, 2019;

Compulsory equipment and tools:

• Digital multimeter;

• Breadboard and Tool kit;

Recommended Resources

R. Boylestad and L. Nashelsky. "Electronic Devices and Circuit Theory," 11th Edition, Pearson, 2012

Additional Costs

During the lab activities, students will be using Moku:Go equipment install in the EE lab. Alternately, students can use Analog Discovery 2/3 devices, which are not provided in this course.

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course. Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct Policy

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Andrey Mirosh nichenko				by appointment	No	Yes
Demonstrator	Khalil As'Ham				by appointment	No	No

Other Useful Information

Academic Information

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey

towards the end of each course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the "On-going Student Feedback" link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups (where applicable). Student opinions really do make a difference. Refer to the Moodle site for your course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct.

https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

Equitable Learning Services (ELS)

Students living with neurodivergent, physical and/or mental health conditions or caring for someone with these conditions may be eligible for support through the Equitible Learning Services team. Equitable Learning Services is a free and confidential service that provides practical support to ensure your mental or physical health conditions do not adversely affect your studies.

Our team of dedicated **Equitable Learning Facilitators** (ELFs) are here to assist you through this process. We offer a number of services to make your education at UNSW easier and more equitable.

Further information about ELS for currently enrolled students can be found at: https://www.student.unsw.edu.au/equitable-learning

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct. Find relevant information at: Student Code of Conduct (unsw.edu.au)

Plagiarism undermines academic integrity and is not tolerated at UNSW. It is defined as using the words or ideas of others and passing them off as your own, and can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

https://student.unsw.edu.au/plagiarism

Submission of Assessment Tasks

Special Consideration

Special Consideration is the process for assessing and addressing the impact on students of short-term events, that are beyond the control of the student, and that affect performance in a specific assessment task or tasks.

Applications for Special Consideration will be accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause;
- The circumstances are unexpected and beyond the student's control;
- The circumstances could not have reasonably been anticipated, avoided or guarded against by the student; and either:

(i) they occurred during a critical study period and was 3 consecutive days or more duration, or a total of 5 days within the critical study period; or

(ii) they prevented the ability to complete, attend or submit an assessment task for a specific date (e.g. final exam, in class test/quiz, in class presentation)

Applications for Special Consideration must be made as soon as practicable after the problem occurs and at the latest within three working days of the assessment or the period covered by the supporting documentation.

By sitting or submitting the assessment task the student is declaring that they are fit to do so and cannot later apply for Special Consideration (UNSW 'fit to sit or submit' requirement).

Sitting, accessing or submitting an assessment task on the scheduled assessment date, after applying for special consideration, renders the special consideration application void.

Find more information about special consideration at: https://www.student.unsw.edu.au/special/consideration/guide

Or apply for special consideration through your MyUNSW portal.

Late Submission of assessment tasks (other than examinations)

UNSW has a standard late submission penalty of:

- 5% per day,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Electronic submission of assessment

Except where the nature of an assessment task precludes its electronic submission, all assessments must be submitted to an electronic repository, approved by UNSW or the Faculty, for archiving and subsequent marking and analysis.

Release of final mark

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is the only official mark.