

ELEC3240: Analog Electronics

Singapore PSB

Trimester 1 - 2024 (Singapore)



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

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|---------------------------------------|--|
| Course Description | This course deals with transistor amplifier circuits, multi-stage transistor amplifiers, differential amplifiers, power amplifiers, operational amplifiers, feedback amplifiers, and non-linear analogue circuits. The above areas along with analogue-to-digital and digital-to-analogue conversion are developed with view to interfacing sensors to computer equipment. Practical issues when implementing high-performance analogue electronic systems are also discussed. |
| Academic Progress Requirements | Nil |
| Assumed Knowledge | ELEC2320 |
| Contact Hours | Singapore PSB Laboratory Face to Face On Campus 10 hour(s) per term See timetable for further details. Lecture Face to Face On Campus 3 hour(s) per week(s) for 13 week(s) starting Week 1 Tutorial Face to Face On Campus 1 hour(s) per week(s) for 13 week(s) starting Week 1 |
| Unit Weighting | 10 |
| Workload | Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course. |

COURSE OUTLINE

CONTACTS

| | |
|---------------------------|---|
| Course Coordinator | Singapore PSB Dr Colin Coates Colin.Coates@newcastle.edu.au +61 2 4921 8969 Consultation: By Email |
| Teaching Staff | Other teaching staff will be advised on the course Canvas site. |
| School Office | School of Engineering (Callaghan) SENG-ADMIN@newcastle.edu.au +61 2 4921 5798 |

SYLLABUS

| | |
|---------------------------------|---|
| Course Content | <ol style="list-style-type: none">1. Single Transistor Amplifier Circuits (Small Signal Analysis, Frequency Responses)2. Multiple Transistor Amplifier Circuits (Multistage, Cascode, Differential Amplifiers)3. Power Amplifiers (Class A, B and AB)4. Feedback Amplifiers (Topologies and Stability)5. (Nonlinear) Operational Amplifier Circuits6. Analog-to-Digital Conversion7. Practical Issues with Implementation of High-performance Analog Circuits |
| Course Learning Outcomes | <p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Demonstrate the ability to perform signal and frequency response analysis of analogue transistor circuits.2. Identify the structure, describe the operating principle, and perform analysis of multi-transistor, power amplifier, feedback and operational amplifier circuits.3. Produce evidence-based documentation of complex analogue circuit analysis.4. Avoid the common practical mistakes when implementing high-performance analogue circuits. |
| Course Materials | <p>Lecture Materials:</p> <ul style="list-style-type: none">- Lecture material will be made available on Canvas. <p>Other Resources:</p> <ul style="list-style-type: none">- Mark N Horenstein, "Microelectronic Circuits and Devices", 2nd Edition, Prentice Hall, 1996- Paul Horowitz and Winfield Hill, "The Art of Electronic", 3rd Edition, Cambridge University Press, 2015 <p>Recommended Text:</p> <ul style="list-style-type: none">- Adel S. Sedra, Kenneth C. Smith, Tony Chan Carusone, and Vincent Gaude, "Microelectronic Circuits" 8th Edition, Oxford University Press, 2019 (previous editions of this text are also suitable) |

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

| | Assessment Name | Due Date | Involvement | Weighting | Learning Outcomes |
|---|---------------------|--|-------------|-----------|-------------------|
| 1 | Written Assignments | There are two written assignments - due dates to be advised in Canvas. | Individual | 20% | 1, 2, 3 |
| 2 | Lab Exercise 1-5 | To be advised in Canvas. | Group | 30% | 1, 2, 3, 4 |
| 3 | Formal Examination | During the formal examination period. | Individual | 50% | 1, 2, 3, 4 |

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Written Assignments

| | |
|----------------------------|--|
| Assessment Type | Written Assignment |
| Purpose | To apply concepts learned during lectures and tutorials. |
| Description | There are two written assignments in this course. They are designed to demonstrate problem analysis and to produce articulate and concise documents which convey evidence-based understanding of the concepts and topics. The assignments are assessed on the basis of a written report (two assignments at 10% weighting each). |
| Weighting | 20% |
| Length | See assignment descriptions in Canvas. |
| Due Date | Assignment 1 - due date to be advised in Canvas. Assignment 2 - due date to be advised in Canvas. |
| Submission Method | Online Scanned handwritten or typesetted report. |
| Assessment Criteria | See assignment descriptions in Canvas. |
| Return Method | Online |
| Feedback Provided | In Class |

Assessment 2 - Lab Exercise 1-5

| | |
|----------------------------|---|
| Assessment Type | Tutorial / Laboratory Exercises |
| Purpose | The lab exercises are designed to aid in developing a practical understanding of the course material. |
| Description | There are five laboratory exercises in this course. They are designed to aid in developing a practical understanding of the course material. The laboratories are assessed based on a written report (five labs at 6% weighting each) which includes a preparation component and an in-class component. |
| Weighting | 30% |
| Length | See individual lab descriptions in Canvas. |
| Due Date | To be advised in Canvas. |
| Submission Method | In Class Online |
| Assessment Criteria | See individual lab descriptions in Canvas. |
| Return Method | In Class Online |
| Feedback Provided | In Class |

Assessment 3 - Formal Examination

| | |
|------------------------|---|
| Assessment Type | Formal Examination |
| Purpose | The final formal examination is designed to test the individual student's knowledge of the course material and their ability to describe, analyse and hypothesise from this material. |
| Description | Formal examination comprising of problems related to lecture content, assignments, tutorials, and laboratory materials. |
| Weighting | 50% |

| | |
|----------------------------|---|
| Length | 2 hours |
| Due Date | During the formal examination period. |
| Submission Method | Formal Exam |
| Assessment Criteria | The final exam will examine all material presented in lectures, tutorials and laboratories. |
| Return Method | Not Returned |
| Feedback Provided | No Feedback |

ADDITIONAL INFORMATION

Grading Scheme This course is graded as follows:

| Range of Marks | Grade | Description |
|----------------|-----------------------|--|
| 85-100 | High Distinction (HD) | Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives. |
| 75-84 | Distinction (D) | Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives. |
| 65-74 | Credit (C) | Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes. |
| 50-64 | Pass (P) | Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes. |
| 0-49 | Fail (FF) | Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action. |

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse
Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>.

**Important Policy
Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at

<https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

This course outline was approved by the Head of School on 29 November 2023. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

| UON Att. | University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements | Taught | Practised | Assessed | Skill Level (1-4) |
|----------|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------|
| | Professional Attributes | | | | |
| 11 | 3.1. Ethical conduct and professional accountability | | | | |
| 12 | 3.2. Effective oral and written communication in professional and lay domains. | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 13 | 3.3. Creative, innovative and pro-active demeanour. | | | | |
| 14 | 3.4. Professional use and management of information. | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 15 | 3.5. Orderly management of self, and professional conduct. | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 16 | 3.6. Effective team membership and team leadership. | | | | |
| | Engineering Ability | | | | |
| 7 | 2.1. Application of established engineering methods to complex engineering problem solving. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 8 | 2.2. Fluent application of engineering techniques, tools and resources. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 9 | 2.3. Application of systematic engineering synthesis and design processes. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 10 | 2.4. Application of systematic approaches to the conduct and management of engineering projects. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| | Knowledge Base | | | | |
| 1 | 1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 2 | 1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 3 | 1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 4 | 1.4. Discernment of knowledge development and research directions within the engineering discipline. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 5 | 1.5. Knowledge of contextual factors impacting the engineering discipline. | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 3 |
| 6 | 1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline. | | | | |