W.Booth School of Engineering Practice &Technology
PROCTECH 2EE3
Electricity and Electronics II
Fall 2023

McMaster University
ENGINEERING

Instructor Information

Yaser M. Haddara
Email: yaser@mcmaster.ca
Office Hours:
To be announced on Avenue.

Course Information

Lectures: T 12:30 - 2:20
Labs: See Mosaic
Tutorials: T01 R 12:30 - 2:20
T02 R 2:30 - 4:20

Course Dates: 09/05/2023 - 12/06/2023
Units: 3.00
Course Delivery Mode: In Person
Course Description: Second course in electricity and electronics covers transformers, passive and active filters, and semiconductor diodes and transistors theory and applications. Two lectures, two tutorials, one lab (three hours); first term Prerequisite(s): ENGTECH 1EL3, 1MC3 and registration in level II or above of Automation Systems Engineering Technology.

Instructor-Specific Course Information

- Exams are comprehensive

- All tests are closed book with a formula sheet provided by the instructor

- The instructor reserves the right to choose the format of any deferred midterms or final exams (format may be written or oral)

- Communication from the instructor to all students will be either posted on Avenue as an update or emailed from Mosaic to the class list; students need to update their email address on Mosaic and to check emails regularly. In particular, this will be the way that I will communicate any emergency class cancellation or reschedule.
- **Communication to the instructor must be directed to the yaser@mcmaster.ca email address and must contain the tag [2EE3] in the subject line. Emails sent to my Avenue inbox or not containing the appropriate tag in the subject line will be ignored.**

- Please note that announcements concerning any type of graded material may be in any format (e.g. announcements may be made only in class). In particular, any announcement made in class, posted on Avenue, or emailed via Mosaic is considered delivered and students are responsible for the material or assessment announced. What this means is that if you skip class and an announcement for a quiz, lab, test, etc. is made in that class, then you are still responsible for that material. If you miss it, then you get a zero.

- Lab reports required may be in any format including a written report, an avenue quiz, submission of the lab record sheet, or a video presentation.

Important Links

- Mosaic
- Avenue to Learn

- Student Accessibility Services - Accommodations
- McMaster University Library
- eReserves

Course Learning Outcomes

For accreditation reasons, these learning outcome statements must be tied back to CEAB graduate attributes (GAs), including those that are measured in this course. If you are unsure how to do this, please contact the Associate Chair Undergraduate in your department.

- Classify filter circuits according to their frequency response
- Explain operation of transformer circuits and their performance parameters
- Explain principles of operation of semiconductor devices
- Compare characteristics and specifications of diodes, transistors, and amplifiers
- Design filter circuits, transformer circuits, power supply regulation circuits, and transistor amplifier circuits to meet specifications and design constraints
- Check the performance of miCheck the performance of microelectronic circuits against real world application requirements

Required Materials and Texts

Textbook Listing: https://textbooks.mcmaster.ca

Introductory Circuit Analysis
ISBN: 978-0-13-392360-5
Authors: Robert Boylestad
Publisher: Pearson
Edition: 13th ed.

Semiconductor Devices: Theory & Application, version 1.0.1
Authors: James M. Fiore
Free pdf will be available on Avenue.

Analog Discovery 2

2EE3 Lab Kit

1EL3 Lab Kit

Class Format

In Person

Course Evaluation

Weekly quizzes (best 5)	5
Mid-term tests (Oct. 21 and Nov. 18)	30
Class participation	5
Labs	30
Final examination (tests cumulative knowledge)	30
Total	100

Percentage grades will be converted to letter grades per the University calendar.

Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79

Grade	Equivalent Grade Point	Equivalent Percentages
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49

Course Schedule

Week 1	**Filters** **Textbook: Introductory Circuit Analysis by Boylestad (same textbook from 1EL3)** CHAPTERS 13-20 REVIEW of AC Circuit Analysis
Week 2	CHAPTER 22 FILTERS AND THE BODE PLOT 22.1 Introduction 22.2 Properties of Logarithms 22.3 Decibels 22.4 Filters 22.5 RC Low-Pass Filters
Week 3	22.6 RC High-Pass Filters 22.7 Bandpass Filters

	22.11 Bode Plots 22.12 Sketching the Bode Response 22.15 Additional Properties of Bode Plots 22.17 Applications
Week 4	**Semiconductor Devices and Circuits** **Textbook: Semiconductor Devices by James Fiore** **Free textbook – Posted on Avenue** IC OPERATIONAL AMPLIFIERS AND BASIC OP-AMP CIRCUITS 14.1 Integrated Circuit Operational Amplifiers 14.2 Biasing Operational Amplifiers 14.3 Voltage Follower Circuits 14.4 Non-Inverting Amplifiers 14.5 Inverting Amplifiers
Week 5	BASIC SEMICONDUCTOR AND PN-JUNCTION THEORY 1. Atomic Theory 2. Conduction in Solids 3. Conductors, Semiconductors, and Insulators 4. n-Type and p-Type Semiconductors 5. The pn-Junction 6. Biased Junctions
Midterm Recess: Monday, October 9 to Sunday, October 15	
Week 6	SEMICONDUCTOR DIODES 2.1 pn-Junction Diodes

	2.2 Characteristics and Parameters 2.3 Diode Approximations 2.4 DC Load Line Analysis 2.9 Zener Diodes TERM TEST 1 Saturday October 21, 12:30 – 2:00 pm Location TBA
Week 7	DIODE APPLICATIONS 3.1 Half-Wave Rectification 3.2 Full-Wave Rectification 3.4 Full-Wave Rectifier Power Supply 3.6 Power Supply Performance and Testing 3.7 Zener Diode Voltage Regulators
Week 8	BIPOLAR JUNCTION TRANSISTORS (BJTs) 4.1 BJT Operation 4.2 BJT Voltages and Currents 4.3 BJT Amplification 4.4 BJT Switching 4.6 Common-Emitter Characteristics BJT BIASING

	5.1 DC Load Line and Bias Point 5.2 Base Bias 5.4 Voltage-Divider Bias 5.5 Comparison of Basic Bias Circuits 5.6 Troubleshooting BJT Bias Circuits 5.7 Bias Circuit Design
Week 9	AC ANALYSIS OF BJT CIRCUITS 6.1 Coupling and Bypassing Capacitors 6.3 Transistor Models and Parameters 6.4 Common-Emitter Circuit Analysis 6.6 Common-Collector Circuit Analysis 6.8 Comparison of CE, CC, and CB Circuits
Week 10	FIELD EFFECT TRANSISTORS 9.1 Junction Field Effect Transistors 9.2 JFET Characteristics 9.3 JFET Data Sheets and Characteristics 9.4 JFET Amplification and Switching 9.5 MOSFETs FET BIASING 10.1 DC Load Line and Bias Point 10.4 Voltage-Divider Bias 10.10 MOSFET Biasing

	TERM TEST 2 Saturday November 18, 12:30 – 2:00 pm Location TBA
Week 11	AC ANALYSIS OF FET CIRCUITS 11.2 FET Models and Parameters 11.3 Common-Source Circuit Analysis 11.7 Comparison of FET and BJT Circuits
Week 12	**Transformers** **Textbook: Introductory Circuit Analysis by Boylestad** **(same textbook from 1EL3)** TRANSFORMERS 23.1 Introduction 23.3 The Iron-Core Transformer 23.4 Reflected Impedance and Power 23.5 Impedance Matching, Isolation, and Displacement 23.6 Equivalent Circuit
Week 13	REVIEW
Classes end: Wednesday, December 6 Final examination period: Friday, December 8 to Thursday, December 21 All examinations MUST be written during the scheduled examination period.	
List of experiments: Labs begin in Week 3 (September 19-23)	
Lab 0	Using Analog Discovery 2
Lab 1	Resonance

Lab 2	Low pass and high pass filters
Lab 3	Bandpass filters
Lab 4	Op-amps
Lab 5	Active filters
Lab 6	Diodes
Lab 7	BJTs
Lab 8	FETs
Lab 9	Transistor amplifiers

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

Turnitin.com

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Generative AI: Use Prohibited

Students are not permitted to use generative AI in this course. In alignment with McMaster academic integrity policy, it "shall be an offence knowingly to … submit academic work for assessment that was purchased or acquired from another source".

This includes work created by generative AI tools. Also state in the policy is the following, “Contract Cheating is the act of “outsourcing of student work to third parties” (Lancaster & Clarke, 2016, p. 639) with or without payment.” Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

APPROVED ADVISORY STATEMENTS

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-proceduresguidelines/

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online

learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

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Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Academic Advising

For any academic inquires please reach out to the Office of the Associate Dean (Academic) in Engineering located in JHE-Hatch 301.

Details on academic supports and contact information are available from:

https://www.eng.mcmaster.ca/programs/academic-advising

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the Policy on Requests for Relief for Missed Academic Term Work.

Academic Accommodation for Religious, Indigenous, or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.