ELEC ENG 3EJ4
Electronic Devices and Circuits II

COURSE OUTLINE

Please refer to course website for updated information.

COURSE DESCRIPTION

Analog and digital electronics; operational amplifier circuits; multistage amplifiers; oscillators; analog and digital integrated circuits; data converters; amplifier frequency response; feedback and stability; computer aids to analysis and design.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): Registration in any Computer Engineering or Electrical Engineering Program, ELECENG 2CJ4 or 2CJ5; and ELECENG 2EI4 or 2EI5; and ELECENG 2CI5

SCHEDULE

Lecture: Monday, Wednesday & Thursday, 10:30 am – 11:20 am, TSH B128.
Tutorial: Friday 11:30 am – 12:20 pm, HSC 1A1.
Lab: Lab starts on Sep. 30, 2019, from even group (i.e., L02, L04, …) on every other week as follows, ITB-AB109.

L01 Mondays 2:30 pm – 5:20 pm	L02 Mondays 2:30 pm – 5:20 pm
L03 Tuesdays 2:30 pm – 5:20 pm	L04 Tuesdays 2:30 pm – 5:20 pm
L05 Wednesdays 2:30 pm – 5:20 pm	L06 Wednesdays 2:30 pm – 5:20 pm
L07 Thursdays 2:30 pm – 5:20 pm	L08 Thursdays 2:30 pm – 5:20 pm
L09 Fridays 2:30 pm – 5:20 pm	L10 Fridays 2:30 pm – 5:20 pm
L11 Tuesdays 5:30 pm – 8:20 pm	

INSTRUCTOR

Dr. Chih-Hung Chen
Email: chench@mcmaster.ca
Office: ITB-A321
Phone: 905-525-9140 ext. 27084
Office Hours**:** By appointment

TEACHING ASSISTANTS

Names, contact information and office hours are provided on the course website.

COURSE WEBSITE/S

http://avenue.mcmaster.ca

COURSE OBJECTIVES

By the end of this course, students should be able to:
Demonstrate their competency and be knowledgeable on the operating principles, design methodologies, analyses and experimental (calculations and measurements) techniques of analog and mixed-signal electronic circuits and their applications. This will be measured using three metrics:

- Knowledge Base for Engineering - Competence in Specialized Engineering Knowledge Related to Electronic Devices and Circuits.
- Problem Analysis - Obtain substantiated conclusions as a result of a problem solution including recognizing the limitations of the solutions.
- Investigation - Capable of selecting appropriate model and methods and identify assumptions and constraints.

ASSUMED KNOWLEDGE

Good knowledge of course material from EE 2EI5 and EE 2CJ4, especially operating principles of semiconductor devices, circuit models, op-amps, analysis and design of basic electronic circuits, circuit analysis including dependent courses, frequency response, and two-port networks.

COURSE MATERIALS

Required Texts:
A. S. Sedra and K.C. Smith, Microelectronic Circuits, 7th Edition, Oxford University Press, 2015.

Reference Texts:
Donald A. Neamen, Electronic Circuit Analysis and Design, 3nd Ed., McGraw-Hill, 2007.

Calculator:
Only the McMaster Standard Calculator (Casio fx-991 MS or MS Plus) will be permitted in tests and examinations. This is available at the Campus Store.

Other:
Lecture notes

COURSE OVERVIEW

Week	Topic	Readings
1 – 2	A/D, D/A Data Converters	Lecture notes
3– 4	Differential & Multi-stage Amplifiers	Lecture notes and part of Text Ch. 9
5 - 6	Frequency Response	Lecture notes and part of Text Ch. 10
7	Mid-term Recess – No Class, No Lab.	
8 - 9	Active Filters	Lecture notes and part of Text Ch. 17
10 - 11	Oscillators and Signal Generators	Lecture notes and part of Text Ch. 18
12 - 13	Negative Feedback	Lecture notes and part of Text Ch. 11

A more detailed time line is available on the course web site.

At certain points in the course it may make good sense to modify the schedule. The instructor may modify elements of the course and will notify students accordingly (in class, on the course website).

LABORATORY OVERVIEW

Week	Topic
5 – 6	Lab #1 – AD & DA Conversion Circuits and Applications
8 – 9	Lab #2 – Multi-stage Amplifier Circuits
10 – 11	Lab #3 – Active Filter Circuits
12 – 13	Lab #4 – Oscillator and its Applications

LABORATORY OPERATION

- At the beginning of every term, every Undergraduate student using an ECE Lab is required to complete the ECE Lab Safety Quiz (one completed quiz covers every course that term). The quiz and other information is provided on the webpage: https://www.eng.mcmaster.ca/ece/resources#health-safety
- Access to all labs is restricted in the interest of security and safety. Information on accessing and using the lab can be found on the webpage: https://www.eng.mcmaster.ca/ece/labs-and-health-safety#Labs-Access-and-Use
- **Sign-in:** Every student is required to sign in and sign out on a list prepared by the TA on duty before and after each lab.
- **Pre-lab preparation:** Every student is required to finish pre-lab questions and show their answers to the TA on duty before each lab (at the signing in stage). 10~30% of the lab mark will be deducted for failure to compete the pre-lab questions. Please don't forget to take the pre-lab answer sheet back after signing in as you may need it in the experiment.

- **Lab experiment:** All students are required to complete their lab experiment before 5:30pm. 10~50% of the lab mark will be deducted for failure to finish the experiment on time. The TA on duty should appear at the lab before 2:25 pm (or 5:20 pm). If necessary, a 5~10 minute tutorial will be given to students by the TA on duty after everybody signs in. The TA on duty will help students on solving the problems encountered in conducting the experiment and on checking the experimental results. The TA on duty will not help students to conduct the experiment.
- **In-Lab Requirements:** Each student must do the pre-lab. The in-lab experiments and requirements can be done in teams of 2 students. However, it is each student's responsibility to make sure that they understand thoroughly all aspects of each lab. No report is required. Instead, there will be two Lab exams. Please note the weighting of each lab exam.
- **Grading Scheme:** Pre-lab preparation: 40%; in-lab experiment and requirements: 60%.

ASSESSMENT

Component	Weight
Labs (3% per lab)	12 %
Mid-Term Exams (26% per exam)	52 %
Final Exam	36 %
Total	100 %

Grading and Evaluation Policies

- Use of books, notes, other copied materials, computers or cell phones are not allowed during exams.
- You will be allowed to have one letter-sized sheet (8.5"x11" and you can write on both sides) for the mid-term exams and two letter-sized sheets for the final exam. Each student should have their one sheet in their own handwriting.
- All exams are closed book and closed notes. Use of computers or cell phones are not allowed during exams.
- All grades are final unless error(s) in marking is proven.
- No deferred mid-term exam. Deferred final exam may be oral. This will depend on the number of students to be examined.

ACCREDITATION LEARNING OUTCOMES

Note: The *Learning Outcomes* defined in this section are measured throughout the course and form part of the Department's continuous improvement process. They are a key component of the accreditation process for the program and will not be taken into consideration in determining

a student's actual grade in the course. For more information on accreditation, please ask your instructor or visit: http://www.engineerscanada.ca .

Outcomes	Indicators	Measurement Method(s)
Recognize terminology and classification of filters, digital-to-analog and analog-to-digital converters, differential and multistage amplifiers, oscillators, and feedback circuits.	1.4 2.3 3.2	lab and exam questions
Identify, describe behavior, and design filters, digital-to-analog and analog-to-digital converters, differential and multistage amplifiers, oscillators, and feedback circuits.	1.4 2.3 3.2	lab and exam questions
Analyze, including small signal, large signal, and frequency response analysis filter circuits, differential and multistage amplifiers, and feedback circuits	1.4 2.3 3.2	lab and exam questions

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.
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.
It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity .
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.

ACADEMIC ACCOMMODATIONS

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

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO

accommodation should submit their request to the Engineering Student Services 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.

STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

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, A2L and/or McMaster email.

ONLINE ACCESS OR WORK

In this course we will be using Avenue To Learn. Students should be aware that, when they access the electronic components of this course, 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 this course will be deemed consent to this disclosure.
If you have any questions or concerns about such disclosure please discuss this with the course instructor.

www.eng.mcmaster.ca/ece

Electrical and Computer Engineering Lab Safety

Information for Laboratory Safety and Important Contacts

This document is for users of ECE instructional laboratories in the Information Technology Building.

This document provides important information for the healthy and safe operation of ECE instructional laboratories. This document is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in ECE. It is expected that revisions and updates to this document will be done continually. A McMaster University lab manual is also available to read in every laboratory.

General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following:

1. Food and beverages are not permitted in the instructional laboratories.
2. A Laboratory Information Sheet on each lab door identifying potential hazards and emergency contact names should be known.
3. Laboratory equipment should only be used for its designed purpose.
4. Proper and safe use of lab equipment should be known before using it.
5. The course TA leading the lab should be informed of any unsafe condition.
6. The location and correct use of all available safety equipment should be known.
7. Potential hazards and appropriate safety precautions should be determined, and sufficiency of existing safety equipment should be confirmed before beginning new operations.
8. Proper waste disposal procedures should be followed.

Location of Safety Equipment

Fire Extinguisher
On walls in halls outside of labs

First Aid Kit
ITB A111, or dial “88” after 4:30 p.m.

Telephone
On the wall of every lab near the door

Fire Alarm Pulls
Near all building exit doors on all floors

Who to Contact

Emergency Medical / Security: On McMaster University campus, call Security at extension **88** or **905-522-4135** from a cell phone.
Non-Emergency Accident or Incident: Immediately inform the TA on duty or Course Instructor.
University Security (Enquiries / Non-Emergency): Dial 24281 on a McMaster phone or dial 905-525-9140 ext. 24281 from a cell phone.
See TA or Instructor: For problems with heat, ventilation, fire extinguishers, or immediate repairs
Environmental & Occupational Health Support Services (EOHSS): For health and safety questions dial 24352 on a McMaster phone or dial 905-525-9140 ext. 24352 from a cell phone.
ECE Specific Instructional Laboratory Concerns: For non-emergency questions specific to the ECE laboratories, please contact 24103.

In Case of a Fire (Dial 88)

When calling to report a fire, give name, exact location, and building.

1. Immediately vacate the building via the nearest Exit Route. Do not use elevators!
2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.
3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!
4. In the event of a fire in your work area shout "*Fire!*" and pull the nearest fire alarm.
5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals which are oxidizable. Use a fire sand bucket for Class D fires.
6. Do not attempt to fight a major fire on your own.
7. If possible, make sure the room is evacuated; close but do not lock the door and safely exit the building.

Clothing on Fire

Do not use a fire extinguisher on people

1. Douse with water from safety shower immediately or
2. Roll on floor and scream for help or
3. Wrap with fire blanket to smother flame (a coat or other nonflammable fiber may be used if blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to

disperse the heat.

Equipment Failure or Hazard

Failure of equipment may be indicative of a safety hazard - You must report all incidents.

Should you observe excessive heat, excessive noise, damage, and/or abnormal behaviour of the lab equipment:

1. Immediately discontinue use of the equipment.
2. In Power Lab, press wall-mounted emergency shut-off button.
3. Inform your TA of the problem.
4. Wait for further instructions from your TA.
5. TA must file an incident report.

Protocol for Safe Laboratory Practice

Leave equipment in a safe state for the next person - if you're not sure, ask!

In general, leave equipment in a safe state when you finish with it. When in doubt, consult the course TA.

Defined Roles

TA	The first point of contact for lab supervision	
ECE Lab Supervisor	Steve Spencer- ITB 147	steve@mail.ece.mcmaster.ca
ECE Course Instructor	Please contact your specific course instructor directly	
ECE Administrator	Kerri Hastings- ITB A111	hastings@mcmaster.ca
ECE Chair	Tim Davidson- ITB A111	davidson@mcmaster.ca