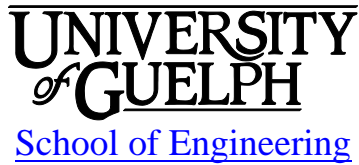


ENGG*3450 Electrical Devices

Fall 2016



(Revision 0: September 8, 2016)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Rafik Guindi, Ph.D.
Office: RICH 3525, ext. 52902
Email: rguindi@uoguelph.ca
Office hours: Mondays: 3:00 pm to 5:00 pm; or by appointment

1.2 Lab Technician

Technician: Hong Ma
Office: RICH 1506, ext. 53873
Email: hongma@uoguelph.ca

1.3 Teaching Assistants

TA	Email	Office Hours
Ahmed Shaltout	ashaltou@uoguelph.ca	TBD
Mohammed Ahmed	mahmed03@uoguelph.ca	TBD
Xia (Zoe) Yufei	yxia02@uoguelph.ca	TBD

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*3450 [CourseLink](#). You are responsible for checking the site regularly.

2.2 Required Resources

- A.S. Sedra & K.C. Smith, Microelectronics Circuits, Oxford, 7th Ed., 2014.

2.3 Recommended Resources

- References are indexed by library call numbers TK7800 to TK8360.

2.4 Additional Resources

Lecture Information: All lecture notes are posted on the ENGG*3450 CourseLink system

Lab Information: The Lab Manual will be posted on the ENGG*3450 CourseLink system

2.5 Communication & Email

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Labs: 35%

- Lab 1 requires no write-up (no grade).
- Labs 2 to 5 are worth 7% each.
- Lab exam (week 12) is worth 7%.

Quizzes: 10%

Two quizzes will be scheduled around the end of the 3rd and the 9th weeks of classes. Each quiz will count for 5% of the total course grade. Scope: Quiz 1 covers material from weeks 1 to 3, Quiz 2 covers material from weeks 7 to 9.

Midterm: 20%

The midterm will be scheduled around the end of the 6th or the beginning of the 7th week of classes. Scope: covers material from weeks 1 to 6.

Final Exam: 35%

December 12th, 2016: 7:00 pm to 9:00 pm, Room TBD. Scope: comprehensive.

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

Missed Quiz or Midterm Exam: There will be no makeup quizzes or midterm exam under normal circumstances. Please check the above paragraphs on Missed Assessments and Accommodation of Religious Obligations if you believe that they apply to your situation.

Lab Work: You must attend and complete all laboratories. If you miss a lab with grounds for granting academic consideration or religious accommodation, arrangements must be made with the instructor to complete a makeup lab upon presentation of a written request and suitable documentation.

Late Lab Reports: Late submissions of lab reports will not be accepted.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

Semiconductors materials, Silicon, Germanium and other semi-conductors' material, Doping and effects of extrinsic material introduction, conduction in metals and semi-conductors, electrical and thermal characteristics of diodes and transistors; principles of modern electronic devices and their applications in circuits; diodes; bipolar and field effect transistors; circuit integration; operational amplifiers; logic gates.

Prerequisite(s): ENGG*2450

4.2 Course Aims

This course is a first course in electronic circuits. The main goals of the course are:

1. Introducing students to basic electronic devices such as the diode, the MOS transistor, and the BJT,
2. Providing a foundation in semiconductor materials and the special properties that make them useful for building electronic devices,
3. Understanding how electronic devices such as diodes and transistors are used to build circuits,
4. Learning how to build simple amplifiers, and how to use the Operational Amplifier to build functional circuits.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Understand the basic electrical characteristics of semiconductors,
2. Describe the principles of operation of diodes and transistors,
3. Apply device models and execute mathematical operations in order to solve circuit problems using the large-signal and small-signal abstractions,
4. Analyze and evaluate the performance of circuits with diodes, transistors, and operational amplifiers,

5. Operate basic electronic instrumentation and communicate about data sheets of electronic devices and integrated circuits,
6. Characterize electronic devices and assemble and troubleshoot simple circuits.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1 to 4	Exams, Labs
2. Problem Analysis	3, 4	Quizzes, Exams
3. Investigation	5, 6	Labs
4. Design	3, 4, 6	Exams, Labs
5. Use of Engineering Tools	5, 6	Labs
6. Communication	2, 4, 6	Labs
7. Individual and Teamwork	5, 6	Labs
8. Professionalism	1 to 6	Exams, Labs
9. Impact of Engineering on Society and the Environment	1 to 6	Exams, Labs
10. Ethics and Equity	1 to 6	Exams, Labs
11. Environment, Society, Business, & Project Management	5, 6	Labs
12. Life-Long Learning	1 to 6	Exams, Labs

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. All lecture notes plus various exercises, examples and referenced resources will be made available to students on CourseLink system in the appropriate module. However, these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide in class solutions to problems that supplement posted notes. Scheduled classes and labs will be the principal venue to provide information and feedback for tests and labs.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and labs. In addition students are encouraged to consult the instructor and the TA during the scheduled office hours or to contact the instructor or TA for any help needed. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

Previous Courses:

ENGG*2450 (Electric Circuits): Circuit elements and their characteristics; Ohm's and Kirchhoff's laws; circuit theorems; RLC circuits; ac analysis.

Follow-on Courses:

ENGG*3050 (Introduction to Mechatronic Systems): Modeling and design of mechatronic systems with electronic and mechanical components.

ENGG*4080 (Micro and Nano-Scale Electronics): Circuit integration and operating principles of analog integrated micro and nano electronic circuits.

ENGG*4390 (Bio-Instrumentation Design): Electronic instrumentation and measurements of biological systems.

ENGG*4550 (VLSI Digital Design): Static and dynamic CMOS gates, latches, registers, pipelining adders, multipliers, shifters.

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Monday	11:30 pm – 12:20 pm	ALEX 100
Wednesday	11:30 pm – 12:20 pm	ALEX 100
Friday	11:30 pm – 12:20 pm	ALEX 100

Lab sessions and tutorial:

Monday	3:30 pm – 5:20 pm	RICH 1504
Wednesday	3:30 pm – 5:20 pm	RICH 1504
Friday	2:30 pm – 4:20 pm	RICH 1504

5.2 Lecture Schedule

Week	Lecture Topics	Text Book	Sections Covered	Learning Objectives
0	Review of Electric Circuits			
1	Diodes	Chapter 4	4.1 – 4.2 – 4.3	2
2	Diode Circuits	Chapter 4	4.4 – 4.5	2, 3, 4
3	Semiconductors	Chapter 3	3.1 – 3.2 – 3.3 – 3.4 – 3.5 - 3.6	1
4	MOSFETs	Chapter 5	5.1 – 5.2	1, 2
5	MOSFET Circuits at DC	Chapter 5	5.3	2, 3, 4
6	Signals and Amplifiers	Chapter 1	1.1 – 1.3 – 1.4 – 1.5.1 to 1.5.4	3

7	MOSFET Amplifiers	Chapter 7	7.1 & 7.3.1 (MOSFET Case) – 7.2.1	3, 4
8	BJTs	Chapter 6	6.1 – 6.2 – 6.3	1, 2
9	BJT Amplifiers	Chapter 7	7.1 & 7.3.1 (BJT Case) – 7.2.2	2, 3, 4
10	Op Amps	Chapter 2	2.1 – 2.2 – 2.3	4
11	Op Amps	Chapter 2	2.4 – 2.5 – 2.8.1 – 2.8.2 – 2.8.3	4
12	Review	Ch. 1 – 7	All of the Above	1 – 5

Topics schedule will be adjusted throughout the course as needed.

5.3 Lab and Tutorial Schedule

Week	Scheduled Activity
0	-
1	Lab 1
2	Tutorial
3	Lab 2
4	Tutorial
5	Lab 3
6	Tutorial
7	Tutorial
8	Lab 4
9	Tutorial
10	Lab 5
11	Tutorial
12	Lab Exam

5.4 Other Important Dates

Friday September 9, 2016: First class

Monday October 10, 2016: Holiday – Class rescheduled to Friday December 2, 2016

Friday November 4, 2016: 40th class day – Last day to drop the course

Wednesday November 30, 2016: last day for regularly scheduled classes

Friday December 2 2016: Makeup for October 10 holiday – Monday schedule.

You can refer the student undergraduate calendar for the semester scheduled dates.

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

<http://www.academicintegrity.uoguelph.ca/>

Please also review the section on Academic Misconduct in your [Engineering Program Guide](#).

The School of Engineering has adopted a Code of Ethics that can be found at:

<http://www.uoguelph.ca/engineering/undergrad-counselling-ethics>

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at [519-824-4120](tel:519-824-4120) ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.csd.uoguelph.ca/csd/>

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>