

**Carleton University**  
**Department of Electronics Engineering**  
**ELEC 3908 – Physical Electronics**  
**Course Outline ----- Winter 2018-2019**

**Introduction:**

This course examines the structure, fabrication, physical operation and modeling of semiconductor diodes, bipolar transistors and MOSFETs.

**Instructor:**

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Web page: [www.doe.carleton.ca/~gauthier](http://www.doe.carleton.ca/~gauthier)  
Course Site: CuLearn

**Course Pack:**

A course pack containing PDFs of course notes and sample problems are available on CuLearn. Lecture summaries and lecture slides are not posted.

**PA Sessions:**

PA sessions are three hours weekly, as indicated in the schedule. In the first half of the session TAs will go over some problems from the sample problems provided in the course pack. The second half is available for individual questions, if necessary. Check Carleton Central for the time and location of PA sessions.

**Lab Sessions:**

Lab sessions occur during the PA time slots in 4135 ME on the weeks associated with writing quizzes, since no new material is covered. The 3-hour PA slot is split into two 1½-hour lab sessions with half of the students assigned to each. The session assignments (1 or 2) are available on CuLearn under the section in which you are enrolled (A1 to A4). The labs have been designed to be completed within the 1½-hour session and the instructions are available on the website. You should read the instructions and come to the lab session prepared. Groups of two students will be assigned to work together to collect data. Analysis of the data and associated calculations are to be done individually. You MUST be signed out of the lab by the TA – reports by students who have not been signed out will not be marked. All lab reports, which must include all the required material compiled into a single PDF, will be due on CuLearn by midnight on the seventh day following the lab, unless otherwise indicated. You must include the name of your lab partner on the cover page of your report. Attending the lab period and the proper collection of required data accounts for approximately half of the lab grade and the analysis of YOUR data for the other half. You MUST attend the entire lab session and be signed off by the TA as having done the lab. Marks will be deducted if you arrive late to your assigned lab session. There is a 10%/day penalty for late reports - submission of all lab reports is MANDATORY for successful completion of the

course. Again, if you are not signed off as completing the lab and/or you are not using the data YOU collected, your lab report will not be marked.

**Quizzes/Final Exam:**

Quizzes are designed to be one hour, closed book and held in-class – you will have the entire 80-minute period to complete the quiz. Quiz times and nominal coverage are indicated on the attached schedule (subject to change). Please be aware that material sometimes gets lost during the return process, and this cannot be compensated in the course. The final exam will be three hours and closed book. For all testing an equation sheet will be given, a copy of which will be available on the website.

**Calculator Policy:**

Programmable calculators will not be allowed in the quizzes or final exam. A “programmable calculator” is defined as a calculator that can store program steps or text at any level of sophistication and the rule applies irrespective of whether or not there appears to be anything stored. If you have any doubts about the eligibility of your calculator, please see me well before the exam. You can’t use your cell phone.

**Course Grade:**

The final grade will be determined using the following weighting.

Quizzes (3@10% each)	30%
Labs (3@5% each)	15%
Final examination	55%
Total	100%

Dated medical documentation is required for exemption from a quiz; in this case the weighting will be moved to the final. Makeup quizzes will not be offered under any circumstances.

**Website Mark Listings:**

Marks will be available on the course website. Please check your marks online and report any discrepancies immediately. Errors must be reported to the appropriate TA during a PA/office hour. *Please note:* Near the end of the term, information will be posted on the course website concerning the final opportunity for mark argument/correction. After that time, the term marks will be closed and there will be no further opportunity for correction or argument. Please monitor the course website for the final deadline.

**Final Exam Availability:**

In keeping with University policy: Students have the right to have questions regarding their grades addressed and to view all material, including material that has not been returned such as final examinations. In some cases, the original submitted work will remain in the possession of the University and the viewing of this work may be supervised. In cases where a student has concerns regarding the

determination of their final grade, the student will be provided with a list of their grades on all components of the course and a description of how their final grade was calculated.

### **Graduate Attributes:**

An institution must demonstrate that graduates of its programs possess the attributes described below. In addition, the institution must implement and employ processes to demonstrate that program outcomes are being assessed in the context of these attributes, and that the results of such assessments will be applied to the further development of programs. The graduate attributes are:

1. **A knowledge base for engineering:** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. **Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.
3. **Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.
4. **Design:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **Use of engineering tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. **Individual and team work:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **Communication skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. **Impact of engineering on society and the environment:** An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. **Ethics and equity:** An ability to apply professional ethics, accountability, and equity.
11. **Economics and project management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. **Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

This course (ELEC 3908) will score attributes 1, knowledge base for engineering. It is scored through a quiz provided in the last PA or class session. The graduate attribute scores may in some cases be derived from graded material, however the graduate attribute scores are not used in determination of the final grade for the course.

### **Academic Accommodation:**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www.carleton.ca/equity/>

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: <http://www.carleton.ca/equity/>

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at <http://www.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/> You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www.carleton.ca/equity/>

**Use of Course Materials:**

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

Course schedule for ELEC 3908 [Winter 2018 - 2019]

Week	Date	Monday	Tuesday	Wednesday	Thursday	Friday
1	Jan. 8, Jan. 10		Intro, Lecture 1 B2: Lab Tutorial		Lecture 2 - 3 B1: Lab Tutorial	
2	Jan. 15, Jan. 17		Lecture 4 - 5 PA: 1 - 3		Lecture 6 - 7 PA: 1 - 3	
3	Jan. 22, Jan 24		Lecture 8 - 9 PA: 4 - 7		Lecture 10 - 11 PA: 4 - 7	
4	Jan. 29, Jan. 31		Lecture 12 PA: 8 - 11		Lecture 13 PA: 8 - 11	
5	Feb 5, Feb. 7		Review Lab 1		Quiz 1 (1 – 10) Lab 1	
6	Feb. 12, Feb. 14		Lecture 14 PA: 12 - 14		Lecture 15 PA: 12 - 14	
	Feb. 18 - 22	Break	Break	Break	Break	
7	Feb. 26, Feb. 28		Lecture 16 - 17 PA: 14 - 15		Lecture 16 - 17 PA: 14 - 15	
8	Mar. 5, Mar. 7		Review Lab 2		Quiz 2 (11 – 15) Lab 2	
9	Mar. 12, Mar. 14		Lecture 18 - 19 PA: 16 - 17		Lecture 20 - 21 PA: 16 - 17	
10	Mar. 19, Mar. 21		Lecture 22 PA: 18 - 21		Lecture 23 PA: 18 - 21	
11	Mar. 26, Mar. 28		Review Lab 3		Quiz 3 (15 – 21) Lab 3	
12	Apr. 2, Apr. 4		Lecture 24 - 25 PA: 22 – 25		Lecture 26 PA: 22 – 25	
13	Apr. 9		Lecture 27 - 28			

Lab / PA Sections:

B1 – Thursday 2:35 – 5:25 (LAB ME 4135 / PA ME 3356)

B2 – Tuesday 2:35 – 5:25 (LAB ME 4135 / PA ME 3356)

Lectures:

Tuesday 10:05 – 11:25 TB 446

Thursday 10:05 – 11:25 TB 446