

**The University of British Columbia
Electrical and Computer Engineering
Fall Semester 2021**

ELEC 451 – Power Electronics

Lectures (DMP 301): Mondays, Wednesdays, and Fridays 3:00 – 4:00 pm
Labs (MacLeod 3042)

Instructor:

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Teaching Assistants:

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Textbook:

Power Electronics: Converters, Applications and Design, 3rd edition
Ned Mohan, Tore M. Undeland, and William P. Robbins
Published by Wiley, October 2002
ISBN-10: 0471226939
ISBN-13: 978-0471226932
Other resources: Simulation software (PSIM)

Evaluation scheme and dates:

Labs (5)	20%	Group L1A: Begins Sep. 19 th Group L1B: Begins Sep. 23 th
Assignments (2)	10%	Sept. 26 th , Nov. 14 th (Release Dates)
Midterm Test	20%	Oct. 21 st
Final	50%	TBD
Lab Schedule	Lab 0	Sep. 19 th , 23 th (L1A/B)
	Lab 1	Oct. 3 rd , 7 th (L1A/B)
	Lab 2	Oct. 17 th , 21 th (L1A/B)
	Lab 3	Oct. 31 th , Nov 4 th (L1A/B)
	Lab 4	Nov. 14 th , 18 th (L1A/B)

For safety and professionalism, check: <https://eng-services.ece.ubc.ca/safety/>

Outline:

1. Power quality, harmonic distortion, and power factor
2. Characteristic of power semiconductor devices
3. Line frequency rectifiers

4. Buck, boost, and buck-boost dc-dc power converters
5. Pulse Width Modulation (PWM) techniques
6. Half-bridge and full-bridge topologies
7. Single- and three-phase voltage source inverters
8. Gate and base driving
9. Basic magnetic devices
10. Isolated power converters

Objectives:

- To understand the fundamentals of power electronics conversion for single- and three-phase, and isolated power
- To be able to select power devices and design basic power electronic converter topologies.
- To be able to use simulation tools for analysis and design, and gain experimental exposure power converters.
- To develop the principles of modeling and control for power electronic conversion.

Students are expected to attend all lectures and tutorials. Participation in laboratory sessions is required. Student should keep track of their marks as the semester progresses. Only the course final mark will be released at the end of the semester (no breakdown).

Academic Integrity:

Copying reports or allowing another student to copy from one's own work is considered a serious academic offence. The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

Link to the relevant Calendar section: <http://www.calendar.ubc.ca/vancouver/?tree=3,54,111,959>

Covid-19 Notes

- Contact advising office and instructors if in-person attendance is not possible for part of the course.
- Complementary course materials will be available on-line. Instructors will be available in hybrid mode for non-classroom support.
- Having a laptop/tablet equipped with microphone and camera is strongly advised.
- If you are sick on a midterm exam day, please complete the online academic concession form (for engineering: <https://academicservices.engineering.ubc.ca/form-request-for-academic-concession-in-term-work/>) and also email the instructor as soon as you are confident you should not come to the scheduled exam. Do not come to class if you are ill.
- If you are sick on a final exam day, do not attend the exam. You must apply for deferred standing (an academic concession) through Engineering Academic Services no later than 48 hours after the missed final exam/assignment. Students who are granted deferred standing write the final exam/assignment at a later date. For additional information about academic concessions, see the UBC policy here: <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,329,0,0>

- Students may provide a 'self-declaration' for short-term illnesses without need for a medical note. Engineering students should report these absences through the online reporting tool at:
<https://academicservices.engineering.ubc.ca/form-request-for-academic-concession-in-term-work/>
- Vaccine Etiquette and Health considerations
 - The University is taking guidance from the BC Public Health Office. The information in this syllabus is based on the current public health orders. Should this information change we will adapt accordingly.
 - Masks are required in all classrooms, and indoor public spaces as per the current Provincial Health Order. For our in-person meetings in this class, it is important that all of us feel as comfortable as possible engaging in class activities while sharing an indoor space. For the purposes of this order, the term "masks" refers to medical and non-medical masks that cover our noses and mouths. You may be asked to remove your mask briefly for an ID check for an exam, but otherwise, your mask should cover your nose and mouth. Please do not eat in class. If you need to drink water/coffee/tea/etc, please keep your mask on between sips. Please note that there are some people who cannot wear a mask. These individuals are equally welcome in our class.
 - An individual's vaccine status is a matter of personal privacy. It is not appropriate to ask an individual about their vaccine status, nor is it appropriate to make group or classroom policies based on vaccine status.
 - Students feeling unwell should stay home in an effort to prevent the transmission of viruses in general.
 - Students are encouraged to sit in the same place or section of the room throughout the term if possible to minimize the number of close contacts you have with others.