University of Manitoba

Department of Electrical & Computer Engineering
Graduate Course Outline

FALL 2022

ECE 7440 – Applied Power Electronics

COURSE DESCRIPTION:

This is a graduate course on high frequency switching power electronics, main components of power electronic converters and emerging low voltage industrial applications.

COURSE OBJECTIVE:

The objective of this course is to provide the static characteristics, the dynamic behaviors and technologies of components in modern power electronics converters, and performance trade-offs of using the components. Furthermore, the architectures of emerging low voltage grid-connected power electronics applications are discussed.

PRE-REQUISITES:

ECE 4370 - Power Electronics (or equivalent)
ECE 4150 - Control Systems (or equivalent)

CONTACT HOURS:

3-hours per week

COURSE CONTENT:

The following topics will be discussed:

1. Introduction of Modern Power Electronics and Emerging Applications
2. Topology
3. Power Semiconductor
4. Magnetic Component
5. Thermal Model
6. Control and Modulation
7. Applications
    a. Photovoltaic Inverters (Energy Generator)
    b. Power Quality Conditioners (Energy Storage)
    c. LED drivers for lighting applications (Emerging Load)

HOMEWORK:

See the Evaluation section below.

TEXTBOOK:

N. Mohan, T. M. Undeland, W. P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley & Sons, 2003.
Recommended Reference Books

1. P. T. Krein, Elements of Power Electronics, Oxford University Press, 1998.
2. Muhammed H. Rashid, Power Electronics: Circuit, Devices and Applications, 2013.

GRADE ANNOUNCEMENTS:

Grades for this course will be announced by Dec 2022

EVALUATION:

Your final course grade is determined by your performance in the components list below in the Evaluation Table (seminar, assignments, project, mid-term, and a final examination. Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.)

Each component is weighted as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Seminars				
Assignments	4	2.5%	10	
Project	1	30%	30	
Mid-Term Exam	1	20%	20	
Final Examination	1	40%	40	
TOTAL			100	

GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

INSTRUCTOR INFO:

Name:..... Dr. Carl Ho
Office:..... E1-390G EITC
Tel:..... (204) 474-7061
Email:..... Carl.Ho@umanitoba.ca

Office Hours: ..... By appointment

VOLUNTARY WITHDRAW:

TBD November 2022

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source