

University of Waterloo
Dept of Electrical and Computer Engineering
ECE 663: Energy Processing
Spring 2019

Instructor: Navid Zargari

Course Outline

Introduction to Power Electronics

Power Semiconductor Devices

Diode, Controllable devices (SCR, GTO, MOSFET, IGBT, GCT); characteristics and losses. Introduction to Wide Band Gap devices

Power Converter Topologies

Diode rectifiers, Phase controlled converters, dc/dc converters, dc/ac and ac/dc converters, interleaved and multi-level converters, ac/ac converters, review of ac drive topologies

Control Techniques in Power Converters

Hysteresis control, Pulse Width Modulation (PWM), Space Vector Modulation, Selective Harmonic Elimination (SHE), modelling of converters and controller design

Power Quality

Harmonic distortion, Power Quality Indices, Harmonic standards, input/output filters and design considerations

Power Electronics Applications

Switch mode power supplies. Adjustable Speed Drives, HVDC Transmission systems, Grid connected applications, Active power filters

Project:

Individual projects will be given in the early part of the course. The deliverable is a report and a possible class presentation (depends on the class size). The project should include literature review, analysis, modelling, simulation results and possible next steps

References:

- Mohan, Undeland, and Robbin, Power Electronics: Converter, Application and Design (2nd or 3rd edition)
- D.W. Hart, Power Electronics, McGraw Hill, 2011,
- Mehrdad Kazerani, ECE663 Lecture slides

LEARN: LEARN will be used for posting course material, assignments, projects, old exams and announcements. It will be used for uploading the deliverables to the appropriate drop boxes.

Grading Scheme

Midterm Exam:	15%
Project:	35%
Final Exam:	50%