

ECE445/545

Power Electronic System Design I

(Winter 2020)

Instructor: R. Tymerski, FAB160-18,
Office hours: see <https://www.pdx.edu/ece/faculty-office-hours>

Textbook: There is no formal textbook. Notes/lectures will be provided as needed. As a reference, the book, “Fundamentals of Power Electronics”, 2nd Edition, R. W. Erickson and D. Maksimovic may be used for some of the course.

Aim: This is a projects based class. The aim of this class is to primarily introduce students to dc-to-dc power converters whose topologies form a basis for topologies in the other areas of power processing. The class involves theory, simulation (using a number of different simulators) and hardware construction of basic converters and closed loop feedback designs.

Grading: There are no exams or quizzes. There will be a number of projects, with likely two main projects. The grading rubric may change a little:

- Project with Report #1 40 %
- Project with Report #2: 40 %
- Miscellaneous, attendance 20 %

The reports are to be written in the form of a technical paper.
To do well in this class students are encouraged to attend all classes.

Course topics:

- Basic dc-to-dc converter topologies.
 - Buck, boost, buck-boost, C1
- Simulation of converters
 - Simulators: PECS, Simplis, PSIM
- Modes of operation
 - Continuous conduction mode (CCM)
 - Discontinuous conduction mode (DCM)
- Modelling of converters
 - Small-signal modelling with State Space Averaging
- Controller design
 - Single loop design
 - Multi-loop design, droop control

Note: On occasion the instructor may need to communicate with the whole class or specific members of the class via the email address the student specified during registration. It is the student’s responsibility to keep this address updated.