

EE 442/642 COURSE SYLLABUS

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Office Hours: T & TR: 10:30-12:00 and 4:00-5:00, and W: 11:00-12:00

Book Title: *Power Electronics Handbook: M.H. Rashid (Editor-in-Chief), 3rd Edition, 2011, ISBN 978-0-12-382036-5*

References:

1. Introduction to Modern Power Electronics, A.M. Trzynadlowski, Wiley-Interscience, 1998.
2. Power Electronics, M.J. Fisher, PSW Kent, 1991.
3. Power Electronics: Principles and Applications, J.M. Jacob, Delmar Thomson Learning, 2002.
4. Power Electronics: Converters, Applications and Design, N. Mohan, T.M. Undeland and W.P. Robbins, John Wiley & Sons, Inc., 2003.
5. P.T. Krein, *Elements of Power Electronics*, Oxford University Press, 1998.

Course Content:

Section I: Power Electronics Switching Devices (The Power Diodes, Power Bipolar Transistors, The Power MOSFET, Insulated Gate Bipolar Transistor, Thyristors, Gate Turn-off Thyristors, MOS Controlled Thyristors (MCTs), Static Induction Devices)

Section II: Power Converters (Diode rectifiers, Controlled rectifiers, DC-DC converters, Inverters, resonant and soft-switching converters, multi-level converters, AC-AC converters, Power factor correction circuits)

Section III: General Applications (Capacitor charging, Electronic ballasts, Power supplies, UPS, Automotive applications, Pulsed power electronics)

Section IV: Power Generation and Distribution (Renewable energy sources and associated inverters, HVDC transmission, FACTS)

Section V: Motor Drives

Section VI: Control of Switching Power Converters

Section VII: Power Quality and EMI Issues (Power quality, Active filters, Effects of EMI)

Course Objectives:

To teach students

- The electrical characteristics of various power switching devices,
- The design and operation of different types of power converters including
 - AC-DC converter
 - DC-DC converters,
 - DC-AC converters,
 - AC-AC converters,
 - Converters with minimum switching losses,
- Application of power electronic systems in various fields including
 - Residential,
 - Commercial and industrial
 - Automotive,
 - Electric utility
 - Motor drives,
- Control and switching methods of power electronic devices
- Power quality issues associated with power electronic circuits

Course Outcomes:

Students should be able to:

- Select appropriate static switches for a specific application,
- Analyze and design AC-DC converters,
- Analyze and design DC-DC converters,
- Analyze and design DC-AC converters,
- Analyze and design AC-AC converters,
- Analyze and design resonant converters (with minimum switching losses),
- Analyze and design electrical drives for different types of motors,
- Analyze and characterize power electronics circuits found in residential, industrial and utility applications.
- Analyze power quality problems and filtering methods.

Computer Usage:

Matlab/Simulink (SimPowerSystems toolbox)

Tests & Homework:

	Subject	Value
Midterm	In-class and take-home portion (Sections I & II)	40 Points

Final	In-class and take-home portion (Sections III-VI)	40 Points
Homework	Mostly simulations	40 Points
Total		120 Points

Grading:

A ≥ 100 > B ≥ 80 > C ≥ 60 > D ≥ 40 > F

Notes:

- Late homework will not be accepted
- There will be no make-up tests.
- Class attendance and participation is highly encouraged.
- Graduate students will be assigned more homework problems, more questions on the tests and the development of some related laboratory experiments.

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An example of academic misconduct is plagiarism: “Using the words or ideas of another, from the internet or any source, without proper citation of the sources.” See the “Student Academic Misconduct Policy” (approved December 9, 2005, located at <<http://studentlife.unlv.edu/judicial/misconductPolicy.html>>).

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Missed Class(es) / Student –

As a general rule, a student missing a class or laboratory assignment because of observance of a religious holiday shall have the opportunity to make up missed work. Students must notify the instructor of anticipated absences by the last day of late registration, January 28, 2008, to be assured of this opportunity. Faculty may give students an additional week, but are encouraged to set a clear deadline. NOTE: Students who

represent UNLV at any official extracurricular activity shall also have the opportunity to make up assignments, but the student must provide official written notification to the instructor no less than one week prior to the missed class(es).

Rebelmail –

By policy, faculty and staff should only e-mail students' Rebelmail accounts. Rebelmail is UNLV's official e-mail system for students. It is one of the primary ways students receive official university communication. All UNLV students receive a Rebelmail account after admission to the university. Non-admitted students should contact the Student Help Desk at (702) 895-0761, in the Student Union Room 231, or by e-mail: studenthelp@unlv.edu. See <http://rebelmail.unlv.edu/> for information.

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