



Department of Electrical Engineering
School of Engineering
University of Management and Technology

Course Outline

Course Code: EE 446 Course Title: Power Electronics Semester: Fall 2017

Program	BSEE
Credit Hours	3
Duration	One semester
Prerequisites	EE208-Electronic Devices and Circuits, EE315- Signals and Systems
Resource Person(s)	Jameel Ahmad, Saima Shaheen
Counseling Hours	Please see the course page on the Learning Management System (LMS)
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Date.....

Course Learning Outcomes (CLOs):

Measurable Learning Outcomes	CLOs	Description	Domain & Level
	CLO1	Explain characteristics of electronic switches and their applications. Classify various types of converters used in power electronics.	Cognitive, Two (C2)
	CLO2	Apply knowledge of Sinusoidal AC circuit theory to calculate expression for instantaneous and average power absorbed by a circuit element. Apply knowledge of Fourier Series to calculate expression for average power, power factor, distortion factor and THD for non-sinusoidal periodic waveforms.	Cognitive, Three (C3)
	CLO3	Analyze current and voltage waveforms for an uncontrolled rectifier with a Diode and controlled half wave rectifier with an SCR and perform power factor calculations with R, RL and RC loads	Cognitive, Four (C4)
	CLO4	Analyze uncontrolled and controlled single-phase and three-phase full-wave rectifiers for various types of loads.	Cognitive, Four (C4)
	CLO5	Analyze single phase AC Voltage controller with R and RL load	Cognitive, Four (C4)
	CLO6	Analyze Non-Isolated DC-DC Converters (Buck, Boost, Buck-Boost, Cuk and SEPIC type) and Isolated DC-DC Converters (Flyback, Forward and Push-Pull Type)	Cognitive, Four (C4)
	CLO7	Analyze DC-AC Converters (single phase and three with different PWM techniques and Evaluate total harmonic distortion, THD)	Cognitive, Five (C5)

Grading Policy	<ul style="list-style-type: none"> • Quizzes + Assignments 25% • Midterm: 25% • Final: 50%
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Mapping of CLOs to Program Learning Outcomes (PLOs):

CLOs/PLOs	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5	CLO 6	CLO 7
PLO 1: Engineering Knowledge	✓	✓	✓	✓	✓	✓	✓
PLO 2: Problem Analysis		✓	✓	✓	✓	✓	✓
PLO 3: Design and Development of Solutions							
PLO 4: Investigation							
PLO 5: Modern Tool Usage							
PLO 6: The Engineer and Society							
PLO 7: Environment and Sustainability							
PLO 8: Ethics							
PLO 9: Individual and Team Work							
PLO 10: Communication							
PLO 11: Project Management							
PLO 12: Life Long Learning							

Learning Methodology:

Classroom lectures, problem solving exercises, Simulations on a software

Required Text Book:

Daniel. W. Hart, **Power Electronics**. New York: McGraw-Hill, 2011, 512 pp.

References:

1. R. W. Erickson and D. Maksimovic. **Fundamentals of Power Electronics**, 2nd ed. New York, NY: Springer, 2001, 912 pp.
2. M. H. Rashid, Ed. **Power Electronics Handbook: Devices, Circuits, and Applications**, 3rd ed. Burlington, MA: Elsevier, 2011, 1417 pp.
3. N. Mohan, T. M. Undeland and W. P. Robbins. **Power Electronics: Converters, Applications, and Design**, 3rd ed. Hoboken, NJ: John Wiley & Sons, 2003, 824 pp.

Tentative Lecture Plan

Course code: EE 446 Course Title: POWER ELECTRONICS

Lectures	Topics	Textbook Chapter(s)	CLOs
1-2	Introduction to power electronics, I-V characteristics of electronic switches and their applications. Classification of various power electronics converters.	1	1
3-6	Power Computations for Non-sinusoidal Periodic Waveforms	2	2
7-10	Analysis of uncontrolled and controlled half wave rectifiers for various types of loads	3.1-3.3,3.7-3.9, 3.11	3
11-14	Analysis of uncontrolled and controlled single-phase and three-phase full-wave rectifiers for various types of loads.	4.1-4.5	4
	Midterm		
17	Analysis of single phase AC Voltage controller with R and RL load	5.1-5.2	5
18-25	Analysis of Non-Isolated DC-DC Converters Buck, Boost, Buck-Boost, Cuk) and Isolated DC-DC Converters (Flyback, Forward and Push-Pull type)	6.1-6.7, 6.11, 7.1-7.4	6
26-30	Understand the DC to AC conversion (single phase and three phase) and different PWM techniques for operation control	8.1-8.5, 8.7-8.12,	7
	Final Exam		

Mapping of CLOs to Direct Assessments

CLOs	Quiz 1	Quiz 2	Quiz 3	Quiz 4	Quiz 5	Quiz 6	Quiz 7	Midterm Exam	Final Exam
1	✓							✓	✓
2		✓						✓	✓
3			✓					✓	✓
4				✓				✓	✓
5					✓				✓
6						✓			✓
7							✓		✓