

COURSE OUTLINE
MEP 1533 – POWER ELECTRONICS SYSTEM
SEMESTER 1 2010/2011 (PESISIR JB)

Lecturer	Dr. Naziha Ahmad Azli
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Course website	
Synopsis	This course provides an understanding of the principles of power electronic conversion systems and the ability to design power converters for certain applications. The topics covered are: 1. Concepts and prospects of power electronic systems: power switches, switching methods, drivers, losses, simulation. 2. ac-to dc conversion: rectifier with different loads, performance criteria, line distortion, effects of line inductance/overlap. 3. dc to dc conversion: non-isolated topologies-Buck, Boost, Buck-boost, CCM, DCM operation, non-idealities, isolated topologies-Flyback, Full-Bridge, switched-mode power supply, converter control. 4. dc to ac conversion: half bridge, full bridge, three-phase, harmonics and THD, square wave, PWM inverters, switching methods-bipolar, unipolar, harmonics elimination PWM, Space Vector modulation, advance inverter topologies. The focus is the design of power converters for specific applications such as utility, domestic appliance, electric vehicle and industrial applications.
Learning Outcomes	By the end of the course, students should be able to demonstrate knowledge of : <ol style="list-style-type: none"> 1. concepts of power electronics conversion systems 2. design of ac to dc conversion (rectifiers) systems 3. design of dc to dc conversion (choppers) systems 4. design of dc to ac conversion (inverters) systems

Schedule

Date and Topics	
Chapter 1 : General Overview and Concepts	
21/8/2010	
1400 – 1800	Applications and prospects, Power switches – types, switching method, driver losses
2030 – 2230	Simulation of power electronics systems
Chapter 2: Rectifier/AC to DC conversion	
22/8/2010	
0900 - 1300	Basic rectifier with different loads, Performance criteria for rectifiers
1400 - 1800	Line distortion consideration, Effect of line inductance/overlap
Chapter 3 : DC - DC Conversion	
02/10/10	
1400 – 1800	Non-isolated DC-DC topologies-Buck, Boost, Buck-boost for CCM and DCM operation, Non-idealities of converters
2030 – 2230	Isolated DC-DC topologies-Flyback, Full-Bridge
03/10/10	
0900 - 1300	Switched-mode power supply-design issues, Converter control
1400 – 1800	Test 1
Chapter 4 : Inverter DC-AC Conversion	

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23/10/2010	
1400 – 1800	Basic inverter topologies – half-bridge, full-bridge single-phase, full-bridge three-phase, Square wave, QSW inverters; PWM inverters
2030 – 2230	Switching methods-bipolar, unipolar, Harmonics of PWM
0900 - 1300	Harmonics elimination PWM, Space Vector modulation, Advance inverter topologies.
1400 – 1800	Test 2, Course Review

Assessment

<u>Type</u>		<u>%</u>
1. Design assignment	2	30
2. Test	2	30
3. Final examination	Format to be announced	40

References

1. Daniel W. Hart, Introduction to Power Electronics, Daniel W. Hart, Prentice Hall International Inc., 1997
2. Mohan, Undeland and Robbins, Power Electronics: Converters, Applications and Design. 2nd Edition,, John Wiley and Sons Inc., 1995.
3. Muhammad H. Rashid, Power Electronics: Circuits, Devices & Applications., Prentice Hall, 2004