SYLLABUS

Date/ Revision	21 March 2017 / Rev. 01
Faculty	Engineering
Approval	Dean of Engineering Faculty

SUBJECT : Power Electronics

1. Identification of Subject:

Name of Subject	: Power Electronics
Code of Subject	: ELEC-3400
SKS	: 3
Semester	: 5
Study Program	: ELE, MTE
Lecturer	: to be announced.

2. Competency

After taking this course, students are expected to be able to:

- Describe the different types of power semiconductor devices and their switching characteristics.
- Describe the operation, characteristics and performance parameters of controlled rectifiers
- Explain the operation, switching techniques and basics topologies of DC-DC switching regulators.
- Describe the modulation techniques of pulse width modulated inverters and to explain the harmonic reduction methods.
- Explain the operation of AC voltage controller and various configurations.

3. Description of Subject:

This course will provide the participants with the knowledge covering backgrounds, scopes and approaches in modern power semiconductor devices as switching devices eg. Diode, SCR,TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics - Triggering and commutation circuit for SCR- Design of Driver and Snubber circuit. The Static and switching characteristics, gate drive and protection techniques will be discussed. Various DC-DC, AC-DC, DC-AC and AC-AC converter circuit topologies, their characteristics and control techniques. The goal of this course is to provide a solid basic understanding of power semiconductor devices, switching power converters, conversion topology and application of power electronics such as drive system for variable speed drives, rectifier and FACTS devices. The theory will be complemented by computer simulations using PSPICE or PSCAD.

4. Learning Approach

Approach	: Combination of Expository - inquiry and colaborative
Method	: Discussion, question answer, sample problem, group work
Student Task	: Project work, presentation
Media	: LCD projector, film.

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5. Evaluation

a)	Absence maximum	: 25%
b)	Participation in discussion	: 5 points
c)	Homework, Classwork	: 5 points
d)	Presentation, Simulation	: 10 points
e)	Daily Quiz	: 20 points
f)	Final Examination	: 60 points

Total

: 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	Introduction		
	• What is Power Electronics?	Ch-01	
	Switching Device		
	Application of Power Electronics		
	Basic Converter Topology		
2	Power semiconductor devices	e le	
	Diode and Thyristor	Ch-02	
	• BJT		
	MOSFET		
	• IGBT		
3	Review of Basic Electrical System		
	• Phasor	Ch-03	
	• RLC circuits	Supplement	
	Three phase electrical system		
	Magnetic Circuits		
Λ	Diode Rectifiers (Half wave and Full wave)		Ouiz-1
	Basic Concept of rectification	Ch-05	Quiz-1
	Single phase rectifier		
	Three phase rectifier		
	 Resistive load, Inductive and capacitive load 		
	 Comparison of Single-Phase and Three-Phase Rectifiers 		
5	Line-Frequency Phase-Controlled Rectifiers and Inverters: Line-		
5	Frequency ac Controlled dc.	Ch-06	
	Thyristor circuit and their control		
	Single phase converter		
	Three phase converter		
	Other Three-Phase Converters	_	
6	DC – DC Switch Mode Converter	01 07	Quiz-2
	Control of dc-dc Converters	Ch-07	
	Basic of DC-DC Converter		
	Buck Converter		
	Boost Converter		

File: ELEC-3400 Power Electronics (28.03.17)

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Buck-Boost Converter		
Cùk-dc Converter		
dge DC-DC converter		
Full bridge DC-DC converter control	Ch-07	
Dc-dc converter comparison		
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8 MIDTERM SEMESTER BREAK 9 Worklab & Computer Simulation Leybold Power Electronics Module Introduction to PSCAD/PSPICE Extra Workbook 10 DC Drives Basic topology of dc drives Application of DC- Drives control Inverters Voltage source inverter Voltage source inverter and current source inverter Quiz-3 11 Introduction PWM inverter Introduction PWM techniques Ch-08 Quiz-4 13 Resonant Converters: Zero-Voltage and/or Zero-Current Switching Classification of Resonant Converter Basic Resonant Circuit Concepts series resonant converter parallel resonant converter parallel resonant converter Leybold Power Electronics Module 14 AC-Motor Drives and Practical Converter Design Consideration Gate drive circuit Gate drive circuit Protection circuit Protection circuit Protection circuit Protection circuit Protection circuit 16 FINAL EXAMINATION <!--</th--><th></th><th>Dc-dc converter comparison</th><th></th><th></th>		Dc-dc converter comparison		
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Protection circuit FINAL EXAMINATION		Gate drive circuit		
16 FINAL EXAMINATION		Protection circuit		
	16	FINAL EXAMINATION		

7. Book Reference:

Main Textbook

Mohan Ned, Tore. M. Undel and, William. P. Robbins,' Power Electronics: Converters, • Applications and Design', John Wiley and sons, third edition, 2003, ISBN: 978-0-471-22693-2

Supplementary:

Leybold Power Electronics and Drives Lab-Manual. •

Cùk-dc Converter Full bridge DC-DC converter

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[Subject to change/MaS/Rev. 01]

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