
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 collaborative
Method	: Discussion, question answer, sample problem, group work
Student Task	: Project work, presentation
Media	: LCD projector, film.

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 <ul style="list-style-type: none"> • What is Power Electronics? • Switching Device • Application of Power Electronics • Basic Converter Topology 	Ch-01	
2	Power semiconductor devices <ul style="list-style-type: none"> • Diode and Thyristor • BJT • MOSFET • IGBT 	Ch-02	
3	Review of Basic Electrical System <ul style="list-style-type: none"> • Phasor • RLC circuits • Three phase electrical system • Magnetic Circuits 	Ch-03 Supplement	
4	Diode Rectifiers (Half wave and Full wave) <ul style="list-style-type: none"> • Basic Concept of rectification • Single phase rectifier • Three phase rectifier • Resistive load, Inductive and capacitive load • Comparison of Single-Phase and Three-Phase Rectifiers 	Ch-05	Quiz-1
5	Line-Frequency Phase-Controlled Rectifiers and Inverters: Line-Frequency ac Controlled dc. <ul style="list-style-type: none"> • Thyristor circuit and their control • Single phase converter • Three phase converter • Other Three-Phase Converters 	Ch-06	
6	DC – DC Switch Mode Converter <ul style="list-style-type: none"> • Control of dc-dc Converters • Basic of DC-DC Converter • Buck Converter • Boost Converter 	Ch-07	Quiz-2

	<ul style="list-style-type: none"> Buck-Boost Converter C_{uk}-dc Converter 		
7	Full bridge DC-DC converter <ul style="list-style-type: none"> Full bridge DC-DC converter control Dc-dc converter comparison 	Ch-07	
8	MIDTERM SEMESTER BREAK		
9	Worklab & Computer Simulation <ul style="list-style-type: none"> Leybold Power Electronics Module Introduction to PSCAD/PSPICE 	Extra Workbook	
10	DC Drives <ul style="list-style-type: none"> Basic topology of dc drives Application of DC- Drives control 		Quiz-3
11	Inverters <ul style="list-style-type: none"> Basic concept of inverter Voltage source inverter and current source inverter 	Ch-08	
12	PWM inverter <ul style="list-style-type: none"> Introduction PWM techniques 		Quiz-4
13	Resonant Converters: Zero-Voltage and/or Zero-Current Switching <ul style="list-style-type: none"> Classification of Resonant Converter Basic Resonant Circuit Concepts series resonant converter parallel resonant converter 	Ch-09	
14	AC-Motor Drives and Practical Converter <ul style="list-style-type: none"> Leybold Power Electronics Module 	Extra Workbook	
15	AC-Motor Drives and Practical Converter Design Consideration <ul style="list-style-type: none"> Snubber circuit Gate drive circuit Protection circuit 	Ch-12	Quiz-5
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.

[Subject to change/MaS/Rev. 01]