

## Faculty of Engineering & Technology

### Power Electronics 1

#### Information :

**Course Code :** EPR 451

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

#### Instructor Information :

Title	Name	Office hours
Professor	Naser Mohammed Bayoumy AbdelRahim	4
Assistant Lecturer	Mohamed Abdallah Mahmoud Shaheen	2
Teaching Assistant	Abeer Tharwat Said Awad	2

#### Area Of Study :

The Main Goals of this course are:

- Develop students knowledge about the characteristics of power switching devices.
- Equip the student with the analytical tools to calculate power computation in power electronic circuits.
- Provide the student with knowledge required to analyse single- and three-phase, un- and controlled AC to DC converters with various types of loads.
- Train the student to perform basic experiments on single- and three-phase AC-DC converters.

#### Description :

Introduction to power electronics, Power diodes, Thyristors: Construction, Characteristics, Application in rectifier circuits (converters), Firing circuits, Diac, Triac and Quadracs. Power transistors as switches, Phase shift controls, Phase controlled rectifiers-static switches.

#### Course outcomes :

##### a. Knowledge and Understanding: :

1 -	Identify the four main categories of power converters.
2 -	Explain the operation and sketch the i-v characteristics of the commonly used power electronic switches, e.g. diodes, SCRs, BJTs, and IGBTs.
3 -	Explain the operation of single-phase un- and controlled AC-DC converters.
4 -	Describe the operation of un- and controlled three-phase AC-DC converters.

##### b. Intellectual Skills: :

1 -	Select appropriate power electronics switching devices for a certain application and check their appropriate behaviour.
2 -	Perform power computations in power electronic circuits.
3 -	Analyze the operation of single-phase half-wave and full-wave un- and controlled AC-DC converters.
4 -	Analyze the operation of three-phase full-wave un- and controlled AC-DC converters

##### c. Professional and Practical Skills: :

1 -	Select appropriate power electronic devices for a certain application.
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2 -	Perform basic experiments on single- and three-phase AC-DC converters.
3 -	Select appropriate power electronics converter in relevant industry applications.
<b>d.General and Transferable Skills: :</b>	
1 -	Work in stressful environment and within constraints.
2 -	Communicate effectively.
3 -	Effectively manage tasks, time, and resources.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction	3	3	0
Power Electronic Switches	8	6	2
Power computations in power electronic circuits	10	6	4
Single-phase half- and full-wave, un- and controlled rectifiers	15	10	5
Three-phase un- and controlled rectifiers	24	9	15

**Teaching And Learning Methodologies :**

Interactive lectures
Experiential learning
Self reading
Report writing
Problem Solving

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		
Mid- Exam I	15.00		
Mid- Exam II	15.00		
o In Class Quizzes	10.00		
o Lab	10.00		
o Participations	10.00		

**Recommended books :**

1. D. W. Hart, Power Electronics, 1st edition, McGraw Hill, 2011, ISBN 978-0-07-338067-4
2. M. H. Rashid, Power Electronics: Devices, Circuits, and Applications, 4th edition, Pearson Higher Education, 2014, ISBN-13: 978-0-13-312590-0
3. Ned Mohan, Power Electronics: A First Course, John Wiley and Sons Ltd, 2011.
3. Ned Mohan, Power Electronics: A First Course, John Wiley and Sons Ltd, 2011.

