



# Engineering Program

Specialty	Automatic Control technology
Course Number	20310221
Course Title	Power Electronics and electrical drive
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



**Brief Course Description:**

This lesson deals with power electronics circuit (diodes, transistors, triac, thyrestors AC voltage control, application to control system and mechanical power transmission, open loop motor speed control

**Course Objectives:**

Upon the completion of the course, the student will be able to:

1. Distinguish power electronics devices.
2. Identify power electronics devices
3. Use power electronics devices.
4. Investigate characteristics of power electronics devices.
5. Test and troubleshoot power electronics devices.
6. Provide basic calculations of power electronics devices.
7. Use energy converters with different loads



## Detailed Course Description:

Unit. number	Unite name	Unite content	Time Needed
1.	<b>Power Semiconductor Devices</b>	<ul style="list-style-type: none"> <li>Types of power electronics circuits, power semiconductor device, power diode, thyristor and its types, power transistor</li> </ul>	
2.	<b>Un controlled Rectifier circuits</b>	<ul style="list-style-type: none"> <li>Single-phase rectifier circuits, filtering, rectifier three phase</li> </ul>	
3.	<b>Controlled rectifiers</b>	<ul style="list-style-type: none"> <li>Single phase have wave converter, single-phase Semi-converter, single – phase full wave converter, single-phase-dual converter, three-phase half-wave converter, three-phase semi-converter, Three phase full-converter, Three-phase Dual-converter</li> </ul>	
4.	<b>DC Choppers</b>	<ul style="list-style-type: none"> <li>The principle of operation, step down DC Choppers, Step- Up DC Choppers,</li> </ul>	
5.	<b>AC Voltage Controllers</b>	<ul style="list-style-type: none"> <li>Principle of operation, Phase angle control, Single Phase controller with inductive load, application</li> </ul>	
6.	<b>Inverter</b>	<ul style="list-style-type: none"> <li>Principle of operation, single-phase bridge inverter, Three-Phase bridge inverter,</li> </ul>	
7.	<b>Stepping Motors Drive</b>	<ul style="list-style-type: none"> <li>Principle and structure of stepping motors, methods of driving stepping motors, technical limits for it.</li> </ul>	
8.	<b>AC Induction Motor Drive</b>	<ul style="list-style-type: none"> <li>Types of control of speed and torque in the AC induction motors</li> </ul>	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

**Evaluation Strategies:**

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

**teaching Methodology:**

- ❖ Lectures

**Text Books & References:**

**Textbook:**

1. M. Rashid, Power Electronics Circuits, Devices and Applications, Upper Saddle River, NJ: Pearson Education, 3<sup>d</sup> Edition, 2003.

**References :**

1. Reddy, Rama S., Fundamentals of Power Electronics, Boca Raton, Fla., CRC Press, 2000.
2. S.B. Dewan and A. Straughter, Power Semiconductor Circuits, John Wiley & Sons, USA, 1994



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# Engineering Program

Specialty	Automatic Control technology
Course Number	20310222
Course Title	Power Electronics and electrical drive Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



**Brief Course Description:**

Lab in support of the power semiconductors devices and electric motor drive system

**Course Objectives:**

Upon the completion of the course, the student will be able to:

1. Distinguish power electronics devices.
2. Use power electronics devices.
3. Troubleshoot power electronics devices.
4. Control Thyristors and power transistors.
5. Connect the power electronics circuits.
6. Troubleshoot power electronics converters.
7. Provide basic calculations related to the output of power electronics converters



## Detailed Course Description:

Unite number	Lab name	Lab content	Time Needed
1	Basic Device & rectifier lab	SCR characteristics Triac characteristics IGBT's characteristics Half Wave rectifier Circuit Center-Tapped full wave Rectifier Bridge Rectifier circuit	(2 week)
2	Phase Control Rectifier Lab	Have-Wave phase control Rectifier Center-Tapped Full-Wave Phase control Rectifier Bridge Phase control Rectifier	(2 week)
3	Chopper circuit Lab	Boost Chopper Buck Chopper Buck –Boost Chopper	(2 weeks)
4	Inverter	Square Wave inverter PWM inverter	(1 weeks)
5	AC Phase Controller	Single phase AC power controller by SCR Single phase cycle converter by SCR	(1 week)
6	Three phase	Control of operating and stopping on point , reversing and forward, stat- delta, speed control of drives, electrical characteristic	6 weeks
7	Stepping motor	Modes of excitation, characteristic	2 weeks

## Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/--/----
	Midterm Exam	20%	--/--/----
	Final Exam	50%	--/--/----

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**Teaching Methodology:**

- ❖ Lab. work

**Text Books & References:**

**PC Based (Power Electronics Trainer)**

**References :**

Instructional Lab. Sheets

