

Applied Electrical Engineering

Basic Course Information			
Course Number	0100116	Subject Category	Core Course, IM
Class Format	Lecture	Credit Type and Number of Credits	1
Department	Mechatronics	Student Category	Year 5
Period of Study	Semester 1	Classes per Week	1
Required Materials			
Instructor	Karl Kashine	Kalluud, Tibard	Taraazoo Chaudh

Course Objectives
 The course provides students with introduction and basic knowledge of power electronics for applied electrical engineering. Topics covered in this course: Power electronics (DC-AC converters (inverters), AC-AC converters, inverters, and semiconductor devices. Through this course, students can be achieved five main objectives as follows:
 1) To be able to explain the description of the switching device;
 2) To be able to explain the principle of DC-DC conversion circuit;
 3) To be able to explain the principle of AC-DC conversion circuit;
 4) To be able to explain the principle of DC-AC conversion circuit;
 5) To be able to explain the principle of AC-AC conversion circuit.

Evaluation/Hubel	Minimal Level of Achievement (Meet Goals)	Standard Level of Achievement (Good)	Unacceptable Level of Achievement (Fail)
Description of the switching device	To be able to explain in detail semiconductor switching devices and their operating principles.	To be able to explain semiconductor switching devices and their operating principles.	Cannot explain semiconductor switching devices and their operating principles.
Principle of DC-DC conversion circuit	To be able to explain in detail the circuits and operating principles of step-down converter and step-up converter, and can explain their applications.	To be able to explain the circuits and operating principles of step-down converter and step-up converter.	Cannot explain the basic DC-DC converter circuits and their operating principles.
Principle of AC-DC conversion circuit	To be able to explain in detail the circuits and operating principles of single phase rectifier and three phase rectifier, and can explain their applications.	To be able to explain the circuits and operating principles of single phase rectifier and three phase rectifier.	Cannot explain the basic AC-DC converter circuits and their operating principles.
Principle of DC-AC conversion circuit	To be able to explain in detail the basic principle of bridge inverter and pulse-modulated inverter, and can explain their applications.	To be able to explain the basic principle of bridge inverter and pulse-modulated inverter.	Cannot explain the basic DC-AC converter circuits and operating principles.
Principle of AC-AC conversion circuit	To be able to explain in detail the operations of AC voltage regulator circuits and basic principle of cycloconverter, and can explain their applications.	To be able to explain the operations of AC voltage regulator circuits and basic principle of cycloconverter.	Cannot explain the basic AC-AC converter circuits and operating principles.

Relationship with Learning Outcomes

MCC Ability to design, process and develop electrical and electronic systems for robotics/mechatronic systems

Phase change

Phase change

Teaching Method

Outline: The course provides students with introduction and basic knowledge of power electronics.

Class Format: Lecture and Exercises

Please Note: All materials will be posted on the Moodle classroom.

Course Plan	Semester 1	Contents and Method of Course	Goals	Related MCC
1st week		Guidance, Overview of power electronics		
2nd week		Fundamentals of power electronics 1	To be able to explain basic of power conversion and their applications	V-C 1-24
3rd week		Fundamentals of power electronics 2	To be able to calculate the mean, rms, power, and Fourier transform of single waveforms.	V-C 1-24
4th week		Ideal switch and switching loss	To be able to explain the characteristics of an ideal switch and the switching loss in a real circuit.	
5th week		Semiconductor switches	To be able to explain the characteristics of semiconductor switches.	V-C 4-58 V-C 4-62
6th week		DC-DC conversion circuit 1	To be able to explain the behavior of inductor and capacitor in circuits and the characteristics of step-down converters.	V-C 5-70
7th week		DC-DC conversion circuit 2	To be able to explain the characteristics of step-up converters.	V-C 5-72
8th week		Mock test for 1st-half and wrap-up of 1st-half	Review and summarize learning	
9th week		Midterm Examination	For week 1-8	
10th week		Midterm Examination/Feedback	Review learning	
11th week		AC-DC conversion circuit 1	To be able to explain the diode bridge rectifier circuit.	V-C 6-70
12th week		AC-DC conversion circuit 2	To be able to explain the 3 phase diode bridge rectifier circuit.	V-C 6-70
13th week		DC-AC conversion circuit 1	To be able to explain the basic principle of inverter and the operation of bridge inverter circuits.	V-C 6-70
14th week		DC-AC conversion circuit 2	To be able to explain the basic principle of pulse-modulated inverter.	V-C 6-70
15th week		AC-AC conversion circuit 1	To be able to explain the operations of AC voltage regulator circuits.	V-C 6-70
16th week		AC-AC conversion circuit 2	To be able to explain the basic principle of cycloconverter.	V-C 6-70
17th week		Applications of power electronics	To be able to explain the applications of power electronics devices.	
18th week		Mock test for 2nd-half and wrap-up of 2nd-half	Review and summarize learning	
19th week		Final Examination	For week 11-17	
20th week		Return Exam Papers and Feedback, and special sessions	Review and summarize learning	

Exam	Examination	Date	Mark	Examinee	Result	Grade
Basic Ability	75	30				
Technical Ability						
Understanding Ability						

Do not