Philadelphia University

Faculty of Engineering and Technology
Mechatronics Engineering Department
Second Semester 2021/2022

Course Details:

Title:	Power Electronics and Drives (0640312), Third Year.
Prerequisite:	Electronics for Mech. and Elec .Machines.
Credit Hours:	3-credit hours (16 weeks per semester, approximately 45 contact hours).
Class Time:	11:15-12:45 Mon, Wed.
Text Book:	Power Electronics, Circuits, Devices, and applications. M. H. Rashid, Prentice Hall, 4th Edition, 2014.
References:	1- Power Electronics, By: Mohan, John Wiley, Last Version. 2- Power Electronics, By: B.K.Bose, Prentice Hal, Last Version.
Description:	The course produces the important part of hardware circuit fundamentals that are required for mechatronics engineering applications. The course will offer knowledge on power semiconductors used as electronic switches in power electronic systems. Converters, protection and drive circuits are also discussed.
Website:	http://www.philadelphia.edu.jo/academics/jghaeb/
Instructor:	Prof. Jasim Ghaeb, Email: jghaeb@philadelphia.edu.jo Office: Mechatronic building, Room 6407, ext: 2304.

Course Outlines:

Week	Basic and support material to be covered
(1)	Introduction, Power electronic system, applications, power processors, power converter classification.
(3)	Power semiconductor devices.
(2)	Thyristor, thyristor characteristics and operation, Turn-on and Turn off.
(4)	Thyristor trigger angle. Thyristor firing circuit applications.
(5)	Commutation circuits, Forced commutation circuit, Line Commutation circuit.

(6)	Gate-turn-off thyristor, GTO on and off, Power MOSFETS, Snubber circuits.
(7)	Single-phase rectifiers, Uncontrolled diode half-wave rectifiers, Application circuits.
(8)	Single-phase full-wave rectifiers, Diode full-wave rectifiers, Application circuits.
(9)	Controlled rectifier. Full-wave controlled rectifier.
(10)	Resistive loads of rectifiers, Inductive loads of rectifiers.
(11)	Three-phase rectifiers, Three-phase half-wave diode rectifiers, Three-phase half-wave controlled rectifiers.
(12)	Three-phase full-wave diode rectifiers, Three-phase full-wave controlled rectifiers.
(13)	DC-AC conversion, Inverters, Half-bridge inverter, Inductive load.
(14)	Voltage control, Pulse-width modulated inverter, Harmonics.
(15)	DC-DC converters, Operation of the step-down converter and step-up converter, converter classification.
(16)	Simulating of power electronic circuits with Simulink-MATLAB.

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, the student should:

1.	Understand the fundamentals of semiconductor switches and power electronic systems.	[1]
2.	Study the applications of electric power converter and drives.	[1]
3.	Investigate the design and response of different converters applying Matrix Laboratory (MATLAB).	[6]

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Sub-Exams: The students will be subjected to at least one exam during the semester.

Quizzes: will be conducted during the semester. The materials of the quizzes are set by the lecturer.

Homework and Projects: Homework and MATLAB simulation should be solved individually and submitted at the required time. Students may be assigned to present project(s).

Final Exam: The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

Grading policy:

Quizzes, Projects or Homeworks	30%
Mid Exam	30%
Final Exam	40%
Total:	100%

Attendance policy:

The semester has in total 45 credit hours. Total absence hours from classes must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course.

Student Outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.