جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: POWER ELECTRONICS

Course Number: 4024140+040841710

General Course Information:

Course title	POWER ELECTRONICS
Course number	4024140+040841710
Credit hours	3
Education type	Face-to-Face (Theoretical and Practical Education)
Prerequisites/corequisites	Electronics(2)
Academic Program	Renewable Energy Engineering- Communications and Electronics
Program code	0402 EE - 408 RE
Faculty	Faculty of Engineering
Department	Communications and Electronics
Level of course	4th year
Academic year /semester	
Awarded qualification	B.Sc.
Other department(s) involved in teaching the course	-
Language of instruction	English
Date of production/revision	

Course Coordinator:

Coordinator'sname	Prof. Walid Emar
Office No	4224
Office Phone extension number	2523
Office Hours	Sunday, Tuesday, Wednesday, Thursday (10:00 – 11:00), (12:00-13:00)
Email	Walid.Emar@iu.edu.jo

Other Instructors:

Instructor name	-
Office No	-
Office Phone extension number	-
Office Hours	-
Email	-

Course Description *(English/Arabic)*:

English	This course covers Power Diodes, Diode Rectifier Circuits, Thyristor Characteristics, Thyristor Rectifier Circuits, AC Voltage Controllers, DC-DC converters, Pulse width Modulation Inverters.
Arabic	صمامات القدرة الثنائية، دوائر تقويم الصمامات الثنائية، خواص الثيرستور، دوائر تقويم الثيرستور، متحكمات الفولتية المترددة، مقطعات DC، عاكسات تضمين سعة النبضة..

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. M. Rashid , Power electronics Circuits , Devices and Application , Prentice hall.
2. Power Electronics, Daniel W. Hart, *Valparaiso University, Valparaiso, Indian,* McGraw-Hill,.
3. Fundamentals of power electronics with Matlab, Randal Shaffer, DA VINCI Engineering series.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

Required book (s), assigned reading and audio-visuals:

1. G.D Simes, Raymond Ramshaw, Power Electronics , thyristor controlled power for electric motors.
2. Power Electronics by P.S. Bhimra, Khanna Publishers.
3. Power Electronics by M.D. Singh and K.B. Khanchandani, TMH.

Course Educational Objectives (CEOs):

1.	Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
2.	To understand the characteristics, modelling, and simulation of power electronic converters.
3.	To understand the modulation techniques of power electronic converters.
4.	Design the power electronic converters with suitable switches meeting a specific load requirement.

Intended Learning Outcomes (ILO's):

1.	Subject Intended learning outcomes (ILOs)	**Relationship to CEOs**	**Contribution to PLOs**	**Bloom Taxonomy Levels***	**Descriptors****
2. A	Knowledge and Understanding:				
3.	The operating principles of various power electronic converters.	1,2	1,2	1,2,3	K
4. B	Intellectual skills:				
5.	Use power electronic simulation packages & hardware to develop the power converters.	1,2	1,2	5,6	S
6. C	Subject specific skills:				
7.	Analyze, design and choose the appropriate converters for various applications	1,2,3,4	1,2	3,4	C
8. D	Transferable skills:				
9.	Being familiar with modulation techniques of power electronic converters.	1,2,3,4	1,2	4,6	C

***Bloom Taxonomy Levels**

Level#	1	2	3	4	5	6
Level Name	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis

**** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:		Descriptors**		
		K	S	C
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		*	

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

☐ **Face to Face**

☐ **Hybrid** *(**2 Lectures** Face – To - Face **+1 Lecture** Asynchronous)*

☐ **Hybrid (***1 Lectures* Face – To - Face ***+1 Lecture*** Asynchronous)

☐ **Online** *(**2 Lectures** Synchronous **+1 lecture Asynchronous**)*

Week	First Hour (F2F)	Second Hour (F2F)	Third Hour (F2F)	Ach. ILOs	Ach. PLOs	Descriptors*
1	PN Junctions and Didoes	PN Junctions and Didoes (2)	PN Junctions and Didoes (3)	A, B	1,2	K, S, C
2	Study of Characteristics of SCR	MOSFET	IGBT	A, C, D	1,2	K, S, C
3	Gate firing circuits for SCR's	Gate firing circuits for SCR's (2)	Gate firing circuits for SCR's (3)	A, C, D	1,2	K, S, C
4	Single Phase half-controlled bridge converter with R and RL loads	Single Phase fully controlled bridge converter with R and RL loads	Single Phase fully controlled bridge converter with R and RL loads (2)	B, C, D	1,2	K, S, C
5	Simulation of single-phase Half wave converter using R, RL and RLE loads	Simulation of single-phase Semi converter using R, RL and RLE loads	Simulation of single-phase Semi converter using R, RL and RLE loads (2)	A, C, D	1,2	K, S, C
6	DC-DC converters with R, RL and RLE Loads	DC-DC converters with R, RL and RLE Loads (2)	DC-DC converters with R, RL and RLE Loads (3)	B, C, D	1,2	K, S, C
7	Simulation of Buck Converters	Simulation of Boost Converters	Simulation of Buck-Boost and SEPIC Converters	**C**	1,2	S, C
8	**Revision**	**Revision**	**Midterm Exam**	**C**	1,2	S, C
9	Simulation of three phase fully controlled converter with R and RL loads	Simulation of rectifiers with and without freewheeling diode	Observation of waveforms for Continuous and Discontinuous modes of operation	A, C, D	1,2	K, S, C
10	Simulation and Observation of waveforms for Continuous and Discontinuous modes	Simulation of operation for Buck and Boost converters.	Simulation of operation for Buck and Boost converters (2)	A, C, D	1,2	K, S, C
11	Single Phase Bridge inverter with R and RL loads	Simulation of Single-Phase Bridge inverter	Simulation of Single-Phase Bridge inverter (2)	A, C, D	1,2	K, S, C
12	Three Phase Bridge inverter with R and RL loads	Simulation of Three Phase Bridge inverter with R and RL loads	Simulation of Three Phase Bridge inverter with R and RL loads (2)	B, C, D	1,2	K, S, C
13	Study of PWM techniques with Forced Commutation circuits	Class A of converters	Class B, Class C, and Class D & Class E) of converters	B, C, D	1,2	K, S, C

14	Single Phase Cycloconverter	AC Voltage Controller with R and RL loads	AC Voltage Controller with R and RL loads (2)	B, C, D	1,2	K
15	Speed control of DC motor	Speed control of DC motor (2)	Speed control of DC motor (3)	B, C, D	1,2	K
16	**Revision**	**Revision**	**FINAL EXAM**	B, C, D	1,2	K, S, C

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:
Interactive videos
Practice Labs
Discussion Forums
Quizzes
Other Interactive online activities
Reports

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Reports **20%**
- Midterm **30%**
- Final Exam **50%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required equipment:

- ✓ PC / Laptop with webcam and mic
- Internet Connection
- ✓ Access to the IU E-Learning Platform at: **https://elearn.iu.edu.jo/**
- E-learning plan
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- ✓ Training

Assessment Tools implemented in the course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Practice Labs
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:….

Responsible Persons and their Signatures:

Course Coordinator	**Prof. Walid Emar**	**Completed Date**	30/10/2022
		Signature	

Received by (Department Head)	**Dr. Zakariya Al-omari**	**Received Date**	30/10/2022
		Signature	