AGU Graduate School of Engineering and Science Electrical and Computer Engineering Program

COURSE RECORD

Code	**ECE 519**
Name	**Power Electronics**
Hour per week	3+0 (Theory + Practice)
Credit	3
ECTS	7.5
Level/Year	Undergraduate and Graduate
Semester	Fall and Spring
Type	Elective
Location	-
Prerequisites	-
Special Conditions	-
Coordinator(s)	Dr. Burak Tekgün
Webpage	
Content	Power electronics concept, power computations, semiconductor switching devices, half wave rectifiers, full wave rectifiers, DC/DC converters, and inverter basics.
Objectives	- Describe the role of power electronics as enabling technology in various applications. - To introduce the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes - To introduce the power electronics equipment - To introduce the single-phase and three-phase utility using diode and SCR rectifiers. - To introduce the basic magnetic concepts, analyze transformer-isolated switch-mode power supplies.
Learning Outcomes	Students will be able to LO1 Recognize basic concepts about power electronics and power semiconductors LO2 Analyze the AC/DC converters, design power electronic circuits and size components LO3 Describe DC/DC converters operating principles, design power electronic circuits and able to size components LO4 Explain DC/AC inverters operating principles, design power electronic circuits and able to size components
Requirements	MATLAB, PSIM, PSpice or a similar circuit simulation software may be used for some homework assignments and term project
Reading List	Textbook 1. Power Electronics, 1st edition, Daniel W. Hart, Mc Graw Hill. Additional Materials 2. Power Electronic Device, Circuit and Applications, 4th Edition, Muhammed Rashid, Pearson.
Ethical Rules and Course Policy	All students should comply with the Honor Code. The highest standards of academic honesty will be applied in this class. Cheating and plagiarism will be dealt severely.

LEARNING ACTIVITIES

Activities	**Number**	**Weight (%)**
Lecture	10	80%
Group Works	1	10%
Presentations	1	10%
	Total	100

ASSESSMENT

Evaluation Criteria	**Weight** (%)
Quizzes	10%
Weekly Assignments	15%
Midterm Exam	40%
Attendance/Participation	05%
Final Exam/Submission	20%
Term Project	10%
Total	100%

For a detailed description of grading policy and scale, please refer to the website https://goo.gl/HbPM2y section 28.

COURSE LOAD

Activity	**Duration** (hour)	**Quantity**	**Work Load** (hour)
In class activities	3	10	30
Group work	3	10	30
Research (web, library)	4	12	48
Required Readings	3	12	36
Pre-work for Presentation	4	10	40
		General Sum	**184**

ECTS: 7.5 (Work Load/25-30)

CONTRIBUTION TO PROGRAMME OUTCOMES*

	PO1	PO2	PO3	PO4	PO5	PO6
LO1	5	2	4	2	1	1
LO2	5	5	4	3	1	4
LO3	5	5	4	3	2	4
LO4	5	5	5	5	2	4

* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

WEEKLY SCHEDULE

W	**Topic**	**Outcomes**
1	Introduction to power electronics, required mathematical concepts	LO1
2	Pulse width modulation, periodic waveforms analysis, power calculations, total harmonic distortion, power factor.	LO1
3	Introduction to single phase uncontrolled AC/DC converters (rectifiers), half wave uncontrolled rectifiers with resistive, inductive and voltage source loads	LO1, LO2
4	Full wave single phase uncontrolled rectifiers with resistive, inductive and voltage source loads	LO1, LO2
5	SCR operation, half wave single phase-controlled rectifiers with resistive, inductive and voltage source loads	LO2
6	Midterm 1	LO1
7	Full wave single phase-controlled rectifiers with resistive, inductive and voltage source loads	LO2
8	Three phase three pulse uncontrolled rectifiers with resistive, inductive and voltage source loads, six pulse, twelve pulse and twenty four pulse three phase uncontrolled rectifiers.	LO2
9	Three phase three pulse-controlled rectifiers with resistive, inductive and voltage source loads, six pulse, twelve pulse and twenty four pulse three phase controlled rectifiers.	LO2

10	Midterm 2	LO2
11	Introduction to DC/DC converters, buck, boost, buck-boost, CUK, and SEPIC converters analyzes.	LO3
12	Continuous and discontinuous conduction mode analyzes. Isolated DC/DC converters, flyback and forward converters. Magnetics basics.	LO3
13	Introduction to DC/AC converters, single phase and three phase pulse width modulation techniques.	LO4
14	Final Exam	LO3, LO4

Dr. Burak Tekgün
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