SEMESTER S4

POWER ELECTRONICS

Course Code	**PEECT 412**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3-0-0-0	**ESE Marks**	60
Credits	3	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	Analog Circuits (PCECT303)	**Course Type**	Theory

Course Objectives:

1. To study the characteristics of power electronic devices.
2. To study different power converter circuits.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction:** Scope and applications of Power Electronics, Properties of ideal switch. **Structure and static characteristics:** Power diodes, Power BJT, Power MOSFET & IGBT – comparison. Basic principles of wide band gap devices – SiC & GaN. **Safe Operating Area:** Power BJT, Power MOSFET & IGBT. **Drive Circuits:** Power BJT and Power MOSFET (any two example circuits – no analysis).	9
2	**SCR:** Structure, two transistor analogy, static characteristics. **Rectifiers:** Three phase diode bridge rectifiers, Single phase half-controlled rectifier with R load – Single phase fully controlled bridge rectifier (continuous conduction) – output voltage equation. Principle of three phase half wave controlled rectifier– (average output voltage equation for continuous load current) – related simple problems (1-phase & 3-phase).	9
3	**DC – DC Switch Mode Converters:** Buck, Boost and Buck-boost DC-DC converters. Waveforms and expression of DC-DC converters for output voltage, voltage and current ripple under continuous conduction mode.	9

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	Isolated converters: Flyback, Forward, Push Pull, Half bridge and Full bridge converters – Waveforms and governing equations.	
4	**DC-AC Switch Mode Inverters:** Inverter topologies, Driven Inverters: Push-Pull, Half bridge and Full bridge configurations, Single phase PWM inverters (Single pulse width and sinusoidal pulse width modulation) – rms output voltage equation and output voltage waveforms.	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Micro project	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Outline the operation of power semiconductor devices and its characteristics.	**K2**
CO2	Design and analyze various rectifier circuits for power devices	**K3**
CO3	Analyze different power converter circuits	**K3**
CO4	Illustrate different types of inverter circuits	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3		3		3	3						2
CO3	3		3	3	3	3	3					2
CO4	3		3	3	3	3	3					2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Power Electronics Essentials & Applications	L Umanand	Wiley India	Reprint Edition 2014
2	Power Electronics Circuits, Devices, and Applications	Muhammad H Rashid	Pearson India	Third Edition

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Power Electronics Converters, Applications, and Design	Ned Mohan, Tore M Undeland, William P. Robbins	Wiley India	Third Edition
2	Power Electronics Principles and Applications	Joseph Vithayathil	Tata McGraw-HILL	Second Reprint 2010
3	Power Electronics	Daniel W Hart	McGraw-HILL	2011
4	SiC and GaN Wide Bandgap Device Technology Overview,	Milligan, J. W., Sheppard, S., Pribble, W., Wu, Y.-F., Muller, G., &Palmour, J. W	2007 IEEE Radar Conference.	doi:10.1109/radar.2007.374395.

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	
2	https://www.youtube.com/watch?v=fOZ8bUrFJGk
3	https://archive.nptel.ac.in/courses/117/108/117108124/
4	https://www.youtube.com/watch?v=Dg5AIy0bY1A

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