

**SEMESTER S 6**  
**POWER ELECTRONICS**

<b>Course Code</b>	<b>OEEVT613</b>	<b>CIE Marks</b>	40
<b>Teaching Hours/Week (L: T:P: R)</b>	3-0-0-0	<b>ESE Marks</b>	60
<b>Credits</b>	3	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	Analog Circuits (PCECT303)	<b>Course Type</b>	Theory

**Course Objectives:**

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

**SYLLABUS**

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	<p><b>Introduction:</b> Scope and applications of Power Electronics, Properties of ideal switch.</p> <p><b>Structure and static characteristics:</b> Power diodes, Power BJT, Power MOSFET &amp; IGBT – comparison. Basic principles of wide band gap devices – SiC &amp; GaN.</p> <p><b>Safe Operating Area:</b> Power BJT, Power MOSFET &amp; IGBT. <b>Drive Circuits:</b> Power BJT and Power MOSFET (any two example circuits – no analysis).</p>	<b>9</b>
<b>2</b>	<p><b>SCR:</b> Structure, two transistor analogy, static characteristics.</p> <p><b>Rectifiers:</b> 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 &amp; 3-phase).</p>	<b>9</b>
<b>3</b>	<p><b>DC – DC Switch Mode Converters:</b> 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.</p> <p><b>Isolated converters:</b> Flyback, Forward, Push Pull, Half bridge and Full</p>	<b>9</b>

	bridge converters – Waveforms and governing equations.	
4	<b>DC-AC Switch Mode Inverters:</b> 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/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written )	Total
5	15	10	10	40

**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
<ul style="list-style-type: none"> <li>• 2 Questions from each module.</li> <li>• Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24marks)</b></p>	<ul style="list-style-type: none"> <li>• Each question carries 9 marks.</li> <li>• Two questions will be given from each module, out of which 1 question should be answered.</li> <li>• Each question can have a maximum of 3 sub divisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p>	<b>60</b>

## Course Outcomes (COs)

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

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

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

### CO-PO Mapping Table:

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

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

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
<b>1</b>	Power Electronics Converters, Applications, and Design	Ned Mohan, Tore M Undeland, William P. Robbins	Wiley India	Third Edition
<b>2</b>	Power Electronics Principles and Applications	Joseph Vithayathil	Tata McGraw-HILL	Second Reprint 2010
<b>3</b>	Power Electronics	Daniel W Hart	McGraw-HILL	2011
<b>4</b>	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.

<b>Video Links (NPTEL, SWAYAM...)</b>	
<b>Module No.</b>	<b>Link ID</b>
<b>1</b>	<a href="https://www.youtube.com/watch?v=fOZ8bUrFJGk">https://www.youtube.com/watch?v=fOZ8bUrFJGk</a>
<b>2</b>	<a href="https://archive.nptel.ac.in/courses/117/108/117108124/">https://archive.nptel.ac.in/courses/117/108/117108124/</a>
<b>3</b>	<a href="https://www.youtube.com/watch?v=Dg5AIy0bY1A">https://www.youtube.com/watch?v=Dg5AIy0bY1A</a>