

# FUTURE VISION BIE

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Future Vision

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<p align="center"><b>POWER ELECTRONICS</b>  <b>B.E., VI Semester (Open Elective, <i>not for E&amp;C students</i>)</b>  <b>[As per Choice Based Credit System (CBCS) Scheme]</b></p>			
<b>Course Code</b>	<b>17EC662</b>	<b>CIE Marks</b>	<b>40</b>
<b>Number of Lecture Hours/Week</b>	<b>03</b>	<b>SEE Marks</b>	<b>60</b>
<b>Total Number of Lecture Hours</b>	<b>40 (08 Hours / Module)</b>	<b>Exam Hours</b>	<b>03</b>
<b>CREDITS – 03</b>			
<p><b>Course Objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Understand the working of various power devices.</li> <li>• Study and analysis of thyristor circuits with different triggering techniques.</li> <li>• Learn the applications of power devices in controlled rectifiers, converters and inverters.</li> <li>• Study of power electronics circuits under different load conditions.</li> </ul>			
<b>Module-1</b>			
<p>Introduction - Applications of Power Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, types of Power Electronic Circuits.  Power Transistors: Power BJTs: Steady state characteristics. Power MOSFETs: device operation, switching characteristics, IGBTs: device operation, output and transfer characteristics. (Text 1) <b>L1, L2</b></p>			
<b>Module-2</b>			
<p>Thyristors - Introduction, Principle of Operation of SCR, Static Anode-Cathode Characteristics of SCR, Two transistor model of SCR, Gate Characteristics of SCR, Turn-ON Methods, Turn-OFF Mechanism, Turn-OFF Methods: Natural and Forced Commutation – Class A and Class B types, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit. (Text 2) <b>L1, L2, L3</b></p>			
<b>Module-3</b>			
<p>Controlled Rectifiers - Introduction, principle of phase controlled converter operation, Single phase full converters, Single phase dual converters.  AC Voltage Controllers - Introduction, Principles of ON-OFF Control, Principle of Phase Control, Single phase control with resistive and inductive loads. (Text 1) <b>L1, L2, L3</b></p>			
<b>Module-4</b>			
<p>DC-DC Converters - Introduction, principle of step-down operation and it's analysis with RL load, principle of step-up operation, Step-up converter with a resistive load, Performance parameters, Converter classification, Switching mode regulators: Buck regulator, Boost regulator, Buck-Boost Regulators. (Text 1) <b>L1, L2</b></p>			
<b>Module-5</b>			
<p>Pulse Width Modulated Inverters- Introduction, principle of operation, performance parameters, Single phase bridge inverters, voltage control of single phase inverters, current source inverters, Variable DC-link inverter, Boost inverter. (Text 1) <b>L1, L2</b></p>			

**Course outcomes:** After studying this course, students will be able to:

- Describe the characteristics of different power devices and identify the applications.
- Illustrate the working of DC-DC converter and inverter circuit.
- Determine the output response of a thyristor circuit with various triggering options.
- Determine the response of controlled rectifier with resistive and inductive loads.

**Evaluation of CIE Marks:**

It is suggested that at least a few experiments of Power Electronics are conducted by the students for better understanding of the course. This activity can be considered for the evaluation of 10 marks out of 40 CIE (Continuous Internal Evaluation) marks, reserved for the other activities.

**Question paper pattern:**

- The question paper will have ten questions
- Each full question consists of 16 marks.
- There will be 2 full questions (with a maximum of Three sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module
- The students will have to answer 5 full questions, selecting one full question from each module

**Text Book:**

1. Mohammad H Rashid, Power Electronics, Circuits, Devices and Applications, 3<sup>rd</sup>/4<sup>th</sup> Edition, Pearson Education Inc, 2014, ISBN: 978-93-325-1844-5.
2. M.D Singh and K B Khanchandani, Power Electronics, 2nd Edition, Tata Mc-Graw Hill, 2009, ISBN: 0070583897.

**Reference Books:**

4. L. Umanand, Power Electronics, Essentials and Applications, John Wiley India Pvt. Ltd, 2009.
5. Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi, 2012.
6. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi, 2005.