**20EE2202 – POWER ELECTRONICS**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Electrical circuit theory, differential &integral calculus. | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | Students undergoing this course are expected to learn: | |
| 1. About characteristics, specifications, commutation methods and protection of thyristor. 2. About phasec ontrolled converters with their applications. 3. The harmonics presence in source current and THD calculation of phase controlled converters. 4. The choppers with their control techniques and its applications. 5. The inverters with their control techniques and applications. 6. The A.C voltage controllers and cyclo-converters with their applications. | |
| **Course Outcomes:** | After completing the course the student will be able to | |
| **CO1** | Understand the characteristics, specifications, protection and commutation methods of thyristor. |
| **CO2** | Analyze single phase controlled rectifiers. |
| **CO3** | Demonstrate three phase controlled rectifiers. |
| **CO4** | Assess and apply the concepts of D.C-D.C converters in steady state operation. |
| **CO5** | Explain the operation of inverters and voltage control techniques. |
| **CO6** | Gain knowledgeon the operation of single phase A.C voltage controllers and single phase cyclo-converters. |
| **Course Content:** | **UNIT-I**  **Thyristors:** Silicon controlled rectifier (SCR’s)- basic theory of operation of SCR-two transistor analogy- static and dynamic characteristics of SCR-turn on methods - gate characteristics- firing circuits for thyristor- series and parallel operation of SCRs- protection of SCR-snubber circuit- ratings of SCRs - commutation methods.  **UNIT-II**  **Phase controlled rectifiers:** Phase control technique, single phase half wave Converters with R & RL loads-single phase full wave converters-Midpoint-full controlled bridge-Half controlled bridge converters with R, RL loads-effect of freewheeling diode- effect of source inductance.  **UNIT-III**  **Three phase controlled rectifiers:** Three pulse and six pulse converters **-** midpoint and bridge connections, average load voltage with R and RL loads - effect of source inductance - presence of harmonics in source current -THD calculation.  **UNIT-IV**  **Choppers:** Step-down and step-up chopper-control strategy– Introduction to types of choppers-A, B, C, D and E -Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.  **UNIT-V**  **Inverters:** Single phase and three phase voltage source inverters (both1200 mode and 1800 mode)– Voltage& harmonic control-PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter,  **UNIT-VI**  **AC voltage controller:** Single phase two SCR’s in anti-parallel - with R and RL loads- derivation of RMS load voltage- current and power factor. TRIAC and its characteristics.  **Cyclo-converters**: Single phase midpoint and bridge configuration cycle-converters with R and RL loads (step up and step down). | |
| **Text books**  **&**  **Reference books:** | **Text books :**   1. *“*Power electronics: circuits, devices and applications*”,* by M.H. Rashid, Pearson Education, PHI Third Edition, New Delhi 2004. 2. “Power electronics”, by P.S. Bimbra, Khanna Publishers, third Edition, 2003. 3. “Power electronics”, by MD Singh and Khanchandani, Second Edition, TMH Publishes.   **Reference books:**   1. *“*Power electronics for technology”, by Ashfaq Ahmed Pearson Education, Indian reprint, 2003. 2. “Power electronics: converters, applications and design”, by Ned Mohan, Tore.M.Undeland, William. P. Robbins, John Wiley and sons, third Edition, 2003. 3. “Elements of power electronics”, by Philip T. Krein, Oxford University Press, 2004 Edition. | |
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