**17EE3202 – POWER ELECTRONICS**

 **(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-2-0 |
| **Pre-requisite:** | Electrical circuit theory, differential &integral calculus.  | **Sessional Evaluation:****External Exam Evaluation:****Total Marks:** | 4060100 |

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| **Course Objectives:** | Students undergoing this course are expected to : |
| 1. Learn about characteristics, specifications, commutation methods and protection of thyristor.
2. Learn about phase controlled converters with their applications.
3. Learn the harmonics presence in source current and THD calculation of phase controlled converters.
4. Learn about choppers with their control techniques and applications.
5. Learn about inverters with their control techniques and applications.
6. Learn about A.C voltage controllers and cyclo-converters with their applications.
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| **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** | Analyze three phase controlled rectifiers. |
| **CO4** | Analyze and apply the concepts of D.C-D.C converters in steady state operation. |
| **CO5** | Understand the operation of inverters and voltage control techniques. |
| **CO6** | Understand 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- derivation of output voltage, time ratio control and current limit control strategies - types of choppers - Morgan’s chopper- Jones chopper and load commutated chopper, waveforms.**UNIT-V****Inverters:** Single phase inverter - basic series inverter- basic parallel inverter - waveform - Mc Murray half bridge inverter - basic operation and wave forms of three phase inverters (120­0 conduction and 1800 conduction)- voltage control techniques for inverters, pulse width modulation techniques- Introduction to CSI- difference between voltage source inverter and 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.**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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