

**POWER ELECTRONICS**

**Prerequisite:** Circuit theory, Physics

**Course Objectives:**

1. To compare characteristics of switching devices.
2. To evaluate the performance of rectifiers.
3. To Design DC-DC converter with given characteristics
4. To Analyze and evaluate the operation of Inverters and Cyclo converter

**UNIT-I: (~ 10 Lecture Hours)**

Power semiconductor devices: Concept of power electronics, scope and applications, types of power converters, power semiconductor switches and their V-I characteristics-diodes, SCR, TRIAC, power BJT, Power MOSFET and IGBT, Thyristor ratings and protection, Methods of SCR commutation, Triggering circuits for SCR.

**UNIT-II: (~ 10 Lecture Hours)**

PHASE CONTROLLED RECTIFIERS: Principles of single-phase fully-controlled converter with R, RL&RLE loads, Principles of single-phase half-controlled converter with RL&RLE loads, Principles of three-phase fully controlled converter operation with highly inductive load, Effect of source inductance, Single phase and Three phase dual converters(Basic operation), numerical problems

**UNIT-III: (~ 8 Lecture Hours)**

DC-DC CONVERTERS: Basic principles of step-down and step-up converters with R&RL loads, maximum and minimum currents, ripple current, converters classification, Switching mode regulators, Buck, Boost and Buck-Boost regulators, Isolated DC-DC converters, Flyback and forward converters, numerical problems

**UNIT-IV: (~ 8 Lecture Hours)**

INVERTERS Introduction, principle of operation, performance parameters, single phase bridge inverters with R&RL loads, 3-phase bridge inverters - 120 and 180 degrees mode of operation, Voltage control of single phase inverters - single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

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| 1) N. Madhukalyan               | 6) <del>Handwritten</del>  | 11) <del>Handwritten</del>       |
| 2) D. Sridhar                   | 7) <del>Handwritten</del>  | 12) G. Anand                     |
| 3) <del>Handwritten</del>       | 8) <del>Handwritten</del>  | 13) <del>Handwritten</del>       |
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| 5)                              | 10) <del>Handwritten</del> | 15) M. S. <del>Handwritten</del> |
|                                 |                            | 16) R. Balasubramaniam           |

**UNIT-V: (~ 9 Lecture Hours)**

**A.C. VOLTAGE CONTROLLERS** Introduction, principle of operation of single phase voltage controllers for R& R-L loads using TRIAC and SCR and its applications-Three phase AC voltage controllers -Basic principle of operation of Cyclo converters with R&RL Loads ,numerical problems.

**Text Books:**

1. M.H.Rashid, "Power Electronics - Circuits, Devices and Applications", PHI, 2018.
2. P.S.Bimbhra, "Power Electronics", Khanna Publishers, New Delhi, 2018.

**Reference Books:**

1. Mohan Undeland Robin, "Power Electronics - Converters, Applications and Design", 3<sup>rd</sup> edition, John Wiley & Sons, 2007.
2. P.C .Sen, "Power Electronics", MC Graw Hill, 2015
3. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

**Course Outcomes:** After completion of this course, the student

1. Able to understand the concepts of power semiconductor devices.
2. Able to analyze the performance single & three phase converters.
3. Able to design DC-DC converters
4. Able to understand the operation of Inverters.
5. Able to analyze single phase AC voltage & dual converters.
6. Able to design of commutation circuits and triggering circuits

- 1) N. Mallekar
- 2) T. S. S. S. S.
- 3) S. S.
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