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**IV Year B.Tech., EEE I Semester**

**L T P C**  
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**Line-Commutated and Active Rectifiers**

(Professional Elective-IV)

**Prerequisite: Electrical circuits**

**Course Objectives:**

1. To analyze diode and SCR rectifiers.
2. To design of three phase rectifiers.
3. To analyze of multi level converters.
4. To analyze of flyback converters

- 13) J. Reddy
- 14) R. Prasad
- 15) M. R. G. J.
- 16) R. Balasubramanian

**UNIT I: (~8 Lecture Hours)**

Diode rectifiers with passive filtering Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current waveshape, effect of source inductance; commutation overlap.

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

Thyristor rectifiers with passive filtering Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape.

**UNIT III (~10 Lecture Hours)**

Multi-Pulse converter - Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation- Single-phase ac-dc single-switch boost converter (6 Hours) Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.

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

Ac-dc bidirectional boost converter - Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

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|-----------------------|--------------|---------------|
| 1) N. Mallekallu      | 5)           | 9) P. S. S.   |
| 2) T. S. Subrahmanyam | 6) R. Prasad | 10) J. Reddy  |
| 3) G. M.              | 7) M. Reddy  | 11) R. Prasad |
| 4) S. S. Subrahmanyam | 8) K. S. S.  | 12) G. S. S.  |

## UNIT V: (~8 Lecture Hours)

Isolated single-phase ac-dc flyback converter - Dc-dc flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

### Text books:

1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht, G. C. Verghese, "Principles of Power Electronics", Addison Wesley, 1991.

### References books:

1. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
2. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2001.

### Course Outcomes:

After completion of this course, the student will be able to

1. Analyse controlled rectifier circuits.
2. Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.
3. Understand the operation of PWM rectifiers – operation in rectification and regeneration modes and lagging, leading and unity power factor mode.
4. Analyze of DC-DC converters.
5. Analyze flyback converters.
6. Design of multi-pulse converters.

- 1) N. Malleddy<sup>\*\*\*</sup>
- 2) S. Subrahmanya
- 3) G. S.
- 4) S. S. Sankar
- 5)
- 6) S. S.
- 7) M. S.
- 8) K. S.

- 9) S. S.
- 10) S. S.
- 11) S. S.
- 12) G. S.
- 13) S. S.
- 14) S. S.
- 15) M. S.
- 16) R. S. Sankar