

|                              |                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------|
| <b>Branch Name:</b>          | Electrical Engineering                                                                  |
| <b>Program Code:</b>         | ET109                                                                                   |
| <b>Course Name:</b>          | Power Electronics-II Practical                                                          |
| <b>Course Code:</b>          | 2ET1090502P                                                                             |
| <b>Pre-requisite Course:</b> | Fundamental Knowledge of Basic Electronics and Power Electronics and Drives is required |

### Course Objectives:

1. To learn the generalized concepts of power electronics invertors including their operation and control which are most commonly used in technical world of power electronics.
2. To learn applications of various switching voltage regulator.
3. To study about various mode operation of Cycloconverters and its application in power electronics.

### Teaching and Examination Scheme:

| Credit | Teaching Scheme<br>Hours per week |   |   |       | Evaluation Scheme (Marks) |      |      |      |                   |      |      |      | Total<br>(Marks) |
|--------|-----------------------------------|---|---|-------|---------------------------|------|------|------|-------------------|------|------|------|------------------|
|        |                                   |   |   |       | Theory (Marks)            |      |      |      | Practical (Marks) |      |      |      |                  |
|        | L                                 | T | P | Total | SEE                       |      | CCA  |      | SEE               |      | CCA  |      |                  |
|        |                                   |   |   |       | Min.                      | Max. | Min. | Max. | Min.              | Max. | Min. | Max. |                  |
| 1      | -                                 | - | 2 | 2     | -                         | -    | -    | -    | 10                | 25   | 10   | 25   | 50               |

### Course Contents:

| Sr. No | Detail of Practical                                                                                                                         | Contact Hours |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1      | To simulate and understand operation of 1-phase AC Voltage Controller in (I) Integral Cycle Control Method (II) Phase Angle Control Method. | 04            |
| 2      | To simulate 1-phase Half Wave AC Voltage Regulator with R, L and R-L Load and observe various waveforms.                                    | 02            |
| 3      | To simulate 1-phase Full Wave AC Voltage Regulator with R, L and R-L Load and observe various waveforms.                                    | 02            |
| 4      | To simulate 3-phase AC Voltage Regulator with R Load and observe various waveforms.                                                         | 02            |
| 5      | To generate gate pulses for inverter using comparison of Sine-wave and Triangular wave (SPWM).                                              | 04            |
| 6      | To simulate and perform Single Phase Half Wave Inverter with R, L and R-L Load.                                                             | 04            |
| 7      | To simulate 3-phase Full Bridge Inverter operating with 180-degree conduction mode.                                                         | 02            |
| 8      | To simulate 3-phase Full Bridge Inverter operating with 120-degree conduction mode.                                                         | 02            |
| 9      | Harmonic spectrum of output voltage for unipolar and bipolar PWM controlled half-bridge and full bridge converter.                          | 02            |
| 10     | SCR based 1-phase Cycloconverters working on the principle of integral half cycle control.                                                  | 02            |
| 11     | To simulate 1-phase Cycloconverters using PSIM/MATLAB.                                                                                      | 02            |
| 12     | Performance of V/F controlled induction motor drive.                                                                                        | 02            |

**Reference Books:**

1. G. K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House, New Delhi, 2<sup>nd</sup> ed.2001.
2. Dr. B. R. Gupta and V. Singhal, "Fundamentals of Electrical Drives and Control", S. K. Kataria & Sons (2014), New Delhi, 5th ed.2001.
3. Vedam Subramanyam, "Power Electronics – Devices, Converters and Applications", New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO  | Description                                                                                                 | Bloom's Taxonomy Level |
|------|-------------------------------------------------------------------------------------------------------------|------------------------|
| CLO1 | Analyze, operate and control DC-to-AC Converters.                                                           | 4 Analyze              |
| CLO2 | Application, operation and control AC-to-AC Converters.                                                     | 3 Applying             |
| CLO3 | Apply the knowledge of power electronic converter for speed control of AC motors.                           | 3 Applying             |
| CLO4 | List out the power electronic converters and their control scheme.                                          | 1 Remembering          |
| CLO5 | Understand operation of 1-phase Half Bridge & Full Bridge Inverter in Unipolar PWM and Bipolar PWM methods. | 2 Understanding        |
| CLO6 | Apply plugging of three phase induction motor at different voltages.                                        | 3 Applying             |

**Mapping of CLOs with POs & PSOs:**

| Course Learning Outcomes | Program Outcomes (POs) |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes(PSOs) |      |      |      |
|--------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------------------------------|------|------|------|
|                          | PO1                    | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                            | PSO2 | PSO3 | PSO4 |
| CLO1                     |                        | L   |     | H   |     | M   |     |     |     |      |      | M    |                                 |      |      | L    |
| CLO2                     | H                      |     |     |     | L   | H   |     | M   |     | L    |      |      | L                               |      | H    |      |
| CLO3                     |                        |     |     | M   |     |     | L   |     |     |      | M    |      | M                               |      |      | L    |
| CLO4                     |                        | L   |     | H   |     | M   |     |     |     |      |      | M    |                                 |      |      | L    |
| CLO5                     |                        |     |     | M   |     |     | L   |     |     |      | M    |      | M                               |      |      | L    |
| CLO6                     | H                      |     |     | H   | L   | M   |     | M   |     |      |      | M    | L                               |      | H    | L    |

H: High, M: Medium, L: Low