Course Syllabi: UEE801 Electric Drives (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UEE801; Electric Drives

2. **Credits and contact hours:** Credits: 4.5; Hours: 6

3. **Text book, title, author, and year**

   - *Dubey, G.K., Power Semiconductor Controlled Drives, Prentice Hall Inc. (1989).*
   - *Pillai, S.K., a Course in Electric Drives, New Age International (P) Limited, Publishers (1989).*
   - *Bose, B.K., Modern Power Electronics and AC Drives, Prentice–Hall of India Private Limited (2006).*
   - *Dubey, G.K., Fundamentals of Electric Drives, Narosa Publications (2001).*
   - *Sen, P.C., Thyristor DC Drives, John Wiley and Sons (1981).*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Definitions and Dynamics of Electric Drives: Concept of electric drive and its classifications, Types of loads, Four-quadrant drive, Dependence of load torque on various factors, Dynamics of motor-load combination, Steady state stability of an electric drive system, Load Equalization.
   Drive Features of Importance: Multi-quadrant operations of DC and AC motors, Energy relations during starting and braking.
   Static Control of Motors: Contactors and relays for electric drives, Control circuits for automatic starters of DC and AC motors including definite time accelerating type.
   Estimation of Motors Rating: Thermal modeling of motors, Types of duty cycles, Calculation of motor rating for duty cycles, Overload factor calculation for short and intermittent duty cycle, Use of load diagrams.
   Semiconductor Controlled Drives: Control of DC drives fed through single-phase and three-phase semi converter and full-converter phase-controlled configurations. Their analysis, Regeneration and braking through static power converters, Control of three phase induction motors by stator voltage and frequency control for speeds below and above synchronous speed. Static rotor resistance control, Static Kramer and Scherbius drives.
   Programmable Logic Controllers: Introduction, relative merits over hard-wired logic and relay, PLC based design of power converters, PLC based control of DC and AC Drives, Energy efficient drives, Losses in electrical drive system, Measure of energy conservation in electric drive, Use of efficient semiconductor converters, Energy efficient operation of drive, Improvement of quality of supply.
   Laboratory Work
   Starting and running characteristics of converter fed AC and DC motor control, Harmonic analysis of AC and DC Drives, V/f based drive, Microprocessor based Drive, PLC based drive. Project on drives using standard software.

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:

- Conceptualize the basic drive system and analyse it for different types of loads.
- Analyse the motor situation during starting and braking.
- Develop control circuitry and devices for control of motor.
- Estimate the motor rating for different condition of load.
- Design the converter circuit for control purpose along with its different configuration.
- Use PLC and converter control to drive on the basis of energy efficiency.

6. **Brief list of topics to be covered**
    - Definitions and Dynamics of Electric Drives
    - Static Control of Motors
    - Estimation of Motors Rating
    - Semiconductor Controlled Drives
    - PLCs