## SEMESTER V

| Sr No | Course Category | Course Code | Course Title | Hours per Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Continual Assessment | End Sem Examination | Total |
| 1. | PCC | 23EE501T | Power Electronics | 4 | 1 | - | 5 | 30 | 70 | 100 |
| 2. | PCC | 23EE501P | Power Electronics Lab | - | - | 2 | 1 | 25 | 25 | 50 |
| 3. | PCC | 23EE502P | Electrical Engineering Drawing & Simulation Lab | - | - | 2 | 1 | 25 | 25 | 50 |
| 4. | PEC | 23EE503T | Electrical Machine Design | 3 | 1 | - | 4 | 30 | 70 | 100 |
| 5. | OE | 23EE561O | Open Elective - II | 3 | - | - | 3 | 30 | 70 | 100 |
| 6. | PCC | 23EE505T | Professional Elective - I | 4 | - | - | 4 | 30 | 70 | 100 |
| 7. | VSC | 23EE504P | Technical Skill Development - II | - | - | 4 | 2 | 50 | - | 50 |
| 8. | SEC | 23EE541P | Career Development - V | - | - | 2 | 1 | 50 | - | 50 |
| | | | **Total** | **14** | **2** | **10** | **21** | **270** | **330** | **600** |
| 9. | MDM | 23EE531M | Multidisciplinary Minor - III | 3 | - | - | 3 | 30 | 70 | 100 |
| | | | | **17** | **2** | **10** | **24** | **300** | **400** | **700** |

| Open Elective – II | |
|---|---|
| 23EE561O (i) | OE-II MATLAB Programming |
| 23EE561O (ii) | OE-II Utilization of Electrical Energy |

| Professional Elective - I | |
|---|---|
| 23EE505T(i) | PE-I Advanced Power System |
| 23EE505T(ii) | PE-I Linear Electronics Circuit |
| 23EE505T(iii) | PE-I Signals & Systems |
| 23EE505T(iv) | PE-I Electrical Machines-II |
| 23EE505T(v) | PE-I Electric Vehicle Architecture |
| 23EE505T(vi) | PE-I PLC & Industrial Automation |

# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

## B. Tech. Scheme of Examination & Syllabus 2024-25

## ELECTRICAL ENGINEERING

### FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE501T | Power Electronics | 4 | 1 | - | 5 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| • To introduce students, the basic theory of power semiconductor devices and their practical application in power electronics<br>• To familiarize the operation principle of AC-DC, DC- DC, DC-AC conversion circuits and their applications<br>• To provide the basis for further study of power electronics circuits and systems. | Students will be able to<br>• Interpret operation of SCR and its characteristics<br>• Interpret principle of switching circuits, AC regulators and its applications.<br>• Analyze and design 1-phase and 3-phase Line commutated converters Circuit.<br>• Describe operation of basic inverter circuits. Analyze single phase and three phase bridge type inverter circuits, it's output voltage control, PWM techniques.<br>• Analyze, design DC/DC converter circuits. |

| **Unit I** | **[15Hrs]** |
|---|---|
| **SCR and Its characteristics:** V-I, turn on & turn off characteristics, rating, gate characteristics, over voltage and over current protection, snubber circuit design.<br><br>**Commutation techniques of SCR**: Natural commutation and forced commutation methods.(numerical on class B commutation) | |
| **Unit II** | **[10Hrs]** |
| **Static controllable switches:** Characteristics & working of MOSFET, Gate turn off thyristor and Insulated gate bipolar transistor, TRIAC, UJT, AC regulator and working principle of UJT as relaxation oscillator. | |
| **Unit III** | **[15Hrs]** |
| **Line commutated converters:**<br>**Single Phase line commutated converters:** Working of single pulse converter, two pulse (mid-point & bridge) converter, effect of source inductance on 1-phase bridge converter, effect of freewheeling diode, single phase semi converter.<br><br>**Three phase line commutated converters:**<br>Working of three pulse converter and six pulse bridge converter, effect of freewheeling diode. | |
| **Unit IV** | **[10Hrs]** |
| **Inverter:**<br>Working of basic series inverter, modified series inverter, bridge inverter, three phase inverter in 120° & 180° Modes, output voltage control, harmonic reduction by pulse width modulation techniques. | |
| **Unit V** | **[10Hrs]** |
| **Chopper:** Principles of step down chopper, step up chopper, impulse commutated chopper, multi-phase chopper, jones chopper.<br><br>**Cycloconverters :** Working of single phase midpoint cycloconverter, single phase bridge type **c**ycloconverter | |

**Text Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Power Electronics Circuits Devices and Applications | M. H. Rashid | Third | Pearson |
| 2 | Power Electronics | M. D. Singh & K. B. Khanchandani | Second | Tata McGraw Hill |
| 3 | Power Electronics | P. C. Sen. | | Tata McGraw Hill |

**Reference Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Power Electronics | Ned Mohan, Tora M. Udeland, William P. Riobbins | | John Wiley & sons |

| | | | | |
|---|---|---|---|---|
| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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## B. Tech. Scheme of Examination & Syllabus 2023-24

## ELECTRICAL ENGINEERING

### FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE501P | Power Electronics Lab | - | - | 2 | 1 | 25 | 25 | 50 |

| Course Objectives | Course Outcomes |
|---|---|
| • To introduce students to understand construction, operation and various characteristics of SCR.<br>• To familiarize students to the different types of power semiconductor devices and their switching Operation, characteristics and performance parameters.<br>• To understand basic operation of AC to DC conversion system.<br>• To understand operation and application of DC to AC power conversion system with harmonic reduction methods.<br>• Operation, switching, techniques and basics topologies of DC-DC switching | • To obtain and analyze the characteristics of power semiconductor devices to plot the characteristics and present the results with findings.<br>• To observe and analyze the switching circuits, AC regulators and its applications.<br>• To demonstrate the working of controlled AC to DC converters with various types of loads and verify the characteristic equations. Develop ability to modify the circuit conditions according to the application requirements.<br>• To demonstrate the working of controlled DC to AC converters with various types of loads and verify the characteristic equations. Develop ability to modify the circuit conditions according to the application requirements.<br>• To demonstrate the working of controlled DC to DC and AC to AC converters with various types of loads and verify the characteristic equations. Develop ability to modify the circuit conditions according to the application requirements. |

| Experiment No. | Title of the Experiment |
|---|---|
| 1 | To Study V-I Characteristics of SCR and Measure Latching and Holding Currents. |
| 2 | To Plot waveform for AC Phase Control using DIAC-TRIAC. |
| 3 | To Determine Intrinsic Stand-off ratio of UJT and study UJT as Relaxation Oscillator. |
| 4 | Single Phase Half-controlled Converter with R & RL load. |
| 5 | Single Phase Fully Controlled Bridge Converter with R & RL loads. |
| 6 | Single-Phase Cycloconverter with R& RL loads. |
| 7 | Forced Commutation Circuits (Class A, Class B, Class C, Class D, Class E and Class F). |
| 8 | Single Phase Series Inverter with R & RL Loads. |
| 9 | To Plot Output Waveform of Jones Chopper. |
| 10 | Simulation of Single Phase Converter. |

**Text Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Power Electronics circuits Devices and Applications | M. H. Rashid | Third | Pearson |
| 2 | Power Electronics | M. D. Singh & K. B. Khanchandani | Second | Tata McGraw Hill |
| 3 | Power Electronics | P. C. Sen | | Tata McGraw Hill |

**Reference Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Power Electronics | Ned Mohan, Tora M. Udeland, William P. Riobbins | | John Wiley & Sons |

| | | | | |
|---|---|---|---|---|
| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

## FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE502P | Electrical Engineering Drawing & Simulation Lab | - | - | 2 | 1 | 25 | 25 | 50 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To Simulate and analyze electrical layouts / circuits in software's like MATLAB and PSIM software.<br>2. To design and draw electrical control circuits and control panels layout. | Students will be able to:<br>1. To identify and draw the standard Electrical equipment symbols.<br>2. To simulate and analyze electrical circuits using MATLAB-Simulink software.<br>3. To model, simulate and analyze electrical power system components using PSIM software and virtual lab.<br>4. To design motor control panels and motor control circuit using AUTOCAD Electrical software. |

| Expt. No. | Title of the experiment |
|---|---|
| 1 | To draw the symbols of Electrical equipment and machines on full imperial drawing sheet. |
| 2 | To design & simulate transmission line to nodal using MATLAB-Simulink. |
| 3 | To design & simulate series RLC circuit using MATLAB-Simulink. |
| 4 | To simulate the first quadrant chopper using P-Sim. |
| 5 | To simulate three-phase balanced & unbalanced load using PSIM software. |
| 6 | To design motor control circuit using Autocad Electrical software. |
| 7 | To design motor control panel using Autocad Electrical software. |
| 8 | To draw and simulate control of Bus voltage through on-load tap changer using virtual lab IITB. |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Basic Electrical Engineering | V.K.Mehta | II | S.Chand |
| 2 | Getting started with MATLAB | Rudra Pratap | III | Oxford |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Electrical Technology | B.L.Theraja | II | S.Chand |

## FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE503T | Electrical Machine Design | 3 | 1 | - | 4 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| This course is intended<br>• To study the basic concepts and applications of Electrical Machine Design.<br>• To design the main dimensions of Electrical Machines and study the effect of design on Electrical machines' performance characteristics. | **Students will be able to**<br>• Design the overall dimensions of 1- phase and 3-phase core type transformer.<br>• Estimate the performance characteristics of the transformer as per specified design requirements and constraints.<br>• Design the overall dimensions of stator of 3 phase Induction Motor<br>• Design the overall dimensions of rotor of 3 phase squirrel cage Induction Motor<br>• Design the overall dimensions of alternator. |

| **Unit I** | **[10Hrs]** |
|---|---|
| **Design of 1-phase and 3-phase core type transformer: -** Classification of transformers based on construction and service conditions, Output equation, overall dimensions of 1-phase and 3-phase core type transformer, need of stepped core cross-section, selection of flux density and current density. | |
| **Unit II** | **[10Hrs]** |
| **Performance characteristics of Transformer: -** Calculations of per unit leakage reactance, regulation and No-load current for 1-phase and 3-phase core type transformer (Derivation of leakage reactance is not expected) | |
| **Unit III** | **[9Hrs]** |
| **Stator Design of 3-phase Induction Motor: -** Output equation of 3-phase Induction motor, selection of specific magnetic loading & specific electric loading, Selection of number and type of stator slots, overall dimensions of the stator core. | |
| **Unit IV** | **[9Hrs]** |
| **Rotor Design of 3-phase Induction Motor: -** Classification of 3-phase Induction motor based on rotor construction, selection of length of air gap and rotor slots, calculations of overall dimension and rotor speed of 3-phase squirrel cage rotor of 3-phase Induction motor. | |
| **Unit V** | **[7Hrs]** |
| **Design of 3-phase alternator: -** Classification of the alternators, peripheral speed and runaway speed, pitch factor and distribution factor . overall dimensions of 3 phase alternator, Calculations of the volume of coolant required per sec for the cooling of the alternator. Advantages of Hydrogen Cooling. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Electrical Machine Design | A. K. Sawhney | New | Dhanpat Rai & Sons |
| 2 | Electrical Machine Design | Balbir Singh | New | Brite |
| 3 | Principles of Electrical Machine Design | R. K. Agarwal | New | Katariya & Sons |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Performance and Design of A.C. Machines | M G Say | New | CBS |
| 2 | Design and Testing of Electrical Machines | M V Deshpande | New | PHI |
| 3 | Electrical Machine Design | V Rajini | 2nd | New Age International |

| | | | | |
|---|---|---|---|---|
| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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## B. Tech. Scheme of Examination & Syllaus 2023-24

## ELECTRICAL ENGINEERING

**FIFTH SEMESTER**

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE504P | Technical Skill Development - II | - | - | 4 | 2 | 50 | - | 50 |

| Course Objectives | Course Outcomes |
|---|---|
| The objective of this course is to impart knowledge on the following topics-<br>• To learn the basic concept, components and programming of PLC & SCADA for Automation.<br>• .To study the basic of C –Programming through Code Tantra<br>• To learn general tests on transformer and transformer oil. | After successful completion of this course students will be able to<br>• Identify and understand components of PLCs for Automation<br>• Develop PLC Programming for given application.<br>• Develop SCADA system for various applications.<br>• Develop C Program for given application<br>• To perform Type, Routine and Special Tests of transformer<br>• To perform tests of transformer oil. |

| Sr. No. | Topic Covered |
|---|---|
| 1. | Basic Instructions, a simple ladder logic program to study and verify logic gates using digital inputs and outputs for PLC. (OR,AND,NOT,NOR,NAND,EXOR,EXNOR) |
| 2 | simple ladder logic program to Execute Boolean expressions that uses digital inputs and outputs for a PLC., implementation of simple ladder logic program using timer (ON Delay Timer, OFF Delay Timer, Retentive Timer) |
| 3 | ladder logic program using counter (Up Counter, Down ), using Math instruction, Traffic Light Control System, Pump ON/OFF System |
| 4 | C –Programming through Code Tantra |
| 5 | General Requirements for Type, Routine and Special Tests |
| 6 | Testing of properties of transformer oil |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Programmable Logic controllers and Industrial Automation | Madhuchhanda Mitra, Samarjit SenGupta | | Penram International Publishing India Pvt. Ltd |
| 2 | Supervisory Control and Data Acquisition | S.A. Boyar | | , ISA Publication |
| 3 | Testing, commissioning, operation and maintenance of electrical equipment | S. Rao | 6th | Khanna Publications |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Programmable Logic controllers | V.R. Jadhav, | | Khanna Publications |
| 2 | Electrical power equipment maintenance and testing | Paul Grill | | CRC Press |

| | | | | |
|---|---|---|---|---|
| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

## FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE505T(v) | PE-I Electric Vehicle Architecture | 4 | - | - | 4 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| • The course will enable students to compare and analyze different types of EVs.<br>• The course will enable students to evaluate the impact of various parameters on the performance of EVs. | **Students will be able to**<br>• Quantify economic and environmental impact of EVs compared to IC engines.<br>• Analyze the mathematical models of EVs and justify impact of various parameters<br>• Compare various types of EV propulsion drive motors and be able to choose best for given application<br>• Enlist various types of EV storage systems and analyze characteristics<br>• Analyze various Power electronic circuit topologies for EVs |

| **Unit I** | **[12Hrs]** |
|---|---|
| **Introduction:**<br>History of EVs – Economic and Environmental impact; Architecture of EV. Basics of vehicle performance, vehicle power source characterization, transmission characteristics. Electric Drivetrains- Basic concept of electric traction, introduction to various electric drive-train topologies. | |
| **Unit II** | **[12Hrs]** |
| **Electric Vehicle Modelling:**<br>Consideration of Rolling Resistance – Transmission Efficiency – Consideration of Vehicle Mass – Tractive Effort – Modelling Vehicle Acceleration – Modelling Electric Vehicle Range -Aerodynamic Considerations –EV Motor Sizing | |
| **Unit III** | **[14Hrs]** |
| **Electric Propulsion:**<br>Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives | |
| **Unit IV** | **[12Hrs]** |
| **Energy Storage:**<br>Introduction to Energy Storage Requirements in Electric Vehicles, Battery based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. | |
| **Unit V** | **[10Hrs]** |
| **Power Converters:**<br>DC-DC converters for EVs, Buck and Buck-Boost Converters, Multi-quadrant DC-DC converters, DC-DC converter applications, DC-AC converters for EVs, Three-phase DC-AC converters, Voltage control of DC-AC inverters using PWM | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Electric and Hybrid Vehicles: Design Fundamentals | Iqbal Hussein | | CRC Press, 2003 |
| 2 | Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design | Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi | | CRC Press, 2004 |
| 3 | Electric Vehicle Technology Explained | James Larminie, John Lowry | | Wiley, 2003 |

## FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE531M | MDM-III Electrical Power System | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| **Students will develop the ability to:**<br>• model & represent the power system components,<br>• represent & calculate the transmission line parameters. | **Students will be able to:**<br>1. Explain the generation, transmission, and distribution of power.<br>2. Calculate transmission line parameters of a power system.<br>3. Classify various distribution schemes, LT & HT cables.<br>4. Evaluate performance of transmission lines by interpretation of equations and analytical solutions in system design.<br>5. Describe basic concepts of Insulators. |

| | |
|---|---|
| **Unit I** | **[9Hrs]** |
| Structure of electrical power systems: - Brief exposure of generation, transmission & distribution aspects; Concept of real, reactive, and complex power; Power Transfer in AC circuits and Reactive Power. Load and their characteristics; Voltage & Frequency dependence of loads. | |
| **Unit II** | **[9Hrs]** |
| Representation of power system components, Inductance & Capacitance of transmission lines. | |
| **Unit III** | **[9Hrs]** |
| Elementary distribution schemes & Cables: - Feeders and Distributors; LT & HT cables. | |
| **Unit IV** | **[9Hrs]** |
| Performance of transmission lines: - Voltage regulation & efficiency of short and medium transmission line using simple series equivalent representation, T- representation, pi- representation. | |
| **Unit V** | **[9Hrs]** |
| Insulators: - Concept of insulator, types of insulators, String efficiency. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Elements of Power System | Gaurav Gadge | 1 | Electro-Tech Publication, Satara |
| 2 | Power System Analysis | C. L. Wadhawa | 6 | New Age International |
| 3 | Power System Analysis | Ashfaq Hussain | 5 | CBS |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Elements of Power System Analysis | W. D. Stevenson | 4 | Mc-Graw Hill |
| 2 | Electric Energy System Theory | O. E. Elgerd | 2 | Mc-Graw Hill |
| 3 | Modern Power System Analysis | Nagrath & Kothari | 3 | Tata Mc-Graw Hill |

# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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## B. Tech. Scheme of Examination & Syllabus 2023-24

## ELECTRICAL ENGINEERING

### FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 23EE561O(ii) | OE-II Utilization of Electrical Energy | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| This course is intended to<br>1. Understand the concept of various Heating, Welding methodologies, Illumination methods and traction supply system.<br>2. Appreciative of the concepts of Electrolysis processes, DG system | **Students will be able to**<br>• Understand use of electric energy for industrial heating.<br>• Study the use of electrical energy in electric welding<br>• Learn basics of Illumination and design of lighting schemes for Various applications<br>• Understand pumps and DG systems and evaluate their performance.<br>• Understand Electric Traction system with its power supply structure. |

| | |
|---|---|
| **Unit I** | **[08Hrs]** |
| **Electric Heating:**<br>Types and methods of electrical heating, advantages of electrically produced heat, types & application of electric heating equipment, transfer of heat. Resistance Ovens: General constructions, design of heating elements, efficiency & losses, radiant heating. Induction heating: Core type & core less induction furnace & application Dielectric heating: Principle and application. Arc furnace: Direct & indirect arc furnace, power supply, characteristics & control. | |
| **Unit II** | **[10Hrs]** |
| **Electric Welding:**<br>Importance, Advantages & Disadvantages of welding, classification of welding processes. Resistance welding, Butt welding, Spot welding, Seam welding, Electric arc welding, ultrasonic welding, laser beam welding. | |
| **Unit III** | **[10Hrs]** |
| **Illumination:**<br>Nature of light, terms used in illumination, solid angle, laws of illumination, Colour Rendering Index(CRI), Design of illumination systems, indoor lighting systems, factory lighting, outdoor lighting design, floodlighting, street lighting, energy saving in lighting systems | |
| **Unit IV** | **[10Hrs]** |
| **Pumps:-**<br>Pump types, system characteristics. Pump curves, factors affecting pump performance, efficient pumping system operation, energy conservation opportunities in pumping system.<br>**Diesel Generating Systems:**<br>Introduction, selection and installation factors, operational factors, energy performance assessment in DG sets, energy saving measures for DG sets | |
| **Unit V** | **[08Hrs]** |
| **Electric Traction:**<br>Traction system, requirement of an ideal traction system, different systems for traction, system of railway electrification, comparison between AC and DC systems, power supply for electric traction system, overhead equipment (collector gear for overhead equipment, conductor-rail equipment), Speed- Time curve for train movement, crest speed, average speed and schedule speed, simplified speed-time curve | |

**Text Books**

| S. N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | "Utilization of Electric Power & Electric Traction" | J.B. Gupta | 10th Edition 2012, Reprint 2021 | S. K. Kataria & Sons, New Delhi. |
| 2 | "Art and Science of Utilization of Electrical Energy" | H Partap | | Dhanpat Rai & Sons, Delhi |

**Reference Books**

| S. N | Title | Authors | link |
|---|---|---|---|
| 1 | Guide book for National Certification Examination for Energy Managers and Energy Auditors, BEE | Bureau of Energy Efficiency | https://aipnpc.org/Guidebooks.aspx |

| | | | | |
|---|---|---|---|---|
| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

# ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

## B. Tech. Scheme of Examination & Syllabus AY: 2025 - 26

## ELECTRICAL ENGINEERING

### FIFTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr. | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 22EEM501T | Electric Vehicle Drives | 4 | - | - | 4 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| • Enable students to learn concepts of Electric Drive, characteristics and braking of Electric Drives<br>• Enables students to learn concept of Various contactors used, MMC design<br>• Enables students to learn concept of Electric Traction system, Control of Traction Motors<br>• Enables student to learn concept of different converters used for control of Electric Drives<br>• Enables students to learn concept of Digital control of Electric Drives using Microprocessor | **Students will be able to**<br>• Recognize Electric Drives, different motors used in Electric Vehicle, their selection and control<br>• Recognize various AC and DC contactors used in starting and control of Electric Drives<br>• Perceive the concept of Electric traction and their control strategies used in practice<br>• Acquire knowledge of various converters used in control of electrical drives in industries<br>• Acquire knowledge of modern control of Electric Drives using microprocessor |

| **Unit I** | **[10 Hrs.]** |
|---|---|
| **Introduction to Electric Drive:**<br>Block Diagram, Advantages of Electric Drives, Different motors used in Electric Vehicles, Selection and Classification of Electric Drives, Classes of Motor Duty, Selection of Power Rating of Motors, Braking of Electric Drives | |
| **Unit II** | **[10 Hrs.]** |
| **AC and DC Contactors and Relays:**<br>Lock out contactors, Magnetic structure, Operation, Arc Interruption, Contactor Rating, HV contactors, Control circuit for automatic starting and braking of DC motors and 3 phase induction motor drives, Control Panel design for MCC | |
| **Unit III** | **[10 Hrs.]** |
| **Electric Traction Drives:**<br>Motors used in AC / DC traction, Their performance and desirable characteristics, requirement and suitability of Motor for traction duty<br>**Traction motor control –**<br>Control of DC traction motor, Series - Parallel control with numerical starting and braking of traction motors | |
| **Unit IV** | **[09 Hrs.]** |
| **Control Schemes for Electric Drives:**<br>Introduction to converters used for Electric Drives, Converters for DC Motor Drives, Converters for AC Motor Drives | |
| **Unit V** | **[09 Hrs.]** |
| **Microprocessor control of Electric Drives:**<br>Application Areas and Functions of Microprocessors in Drive Technology, Selection of a Microprocessor, Basics of control of electric drives using microprocessors | |

**Text Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Electric Drives: Concepts and Applications | Vedam Subrahmanyam | 2nd | TMH |
| 2 | Modern Electric Traction: Including Other Applications of Electrical Engineering in Railways | H Pratap | | Dhanpat Rai |
| 3 | Fundamentals Of Electric Drives And Control | B.R. Gupta (Author), V. Singhal | | Katson |
| 4 | Fundamentals of Electric Drives | G K Dubey | 2nd | Alpha Science |

**Reference Books**

| S. N. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Industrial Motor Control | Stephen L. Herman | 7th | Delmar Cengage Learning |
| 2 | Electric Motor Drives: Modelling Analysis and Control | R. Krishnan | | Prentice Hall |

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| | | June 2025 | 1.0 | Applicable for 2025-26 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |