ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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

B. Tech. Scheme of Examination & Syllabus 2022-23

ELECTRICAL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE501T	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 • To familiarize the operation principle of AC-DC, DC- DC, DC-AC conversion circuits and their applications • To provide the basis for further study of power electronics circuits and systems.	A student who successfully fulfil the course requirements will be able to • understand basic operation of various power semiconductor devices and basic principle of switching circuits • analyze and design an AC/DC rectifier circuit • analyze DC/AC inverter circuit • analyze and design DC/DC converter circuits

Unit I	**[08Hrs]**
SCR and Its characteristics: V-I, turn on & turn off characteristics, rating, gate characteristics, over voltage and over current protection, snubber circuit design. **Commutation techniques of SCR**: Natural commutation and forced commutation method (numerical on class B commutation)	
Unit II	**[08Hrs]**
Static controllable switches: Characteristics & working of MOSFET, Gate turn off thyristor and Insulated gate bipolar transistor, TRIAC, DIAC, UJT , AC regulator and working principle of UJT as relaxation oscillator.	
Unit III	**[08Hrs]**
Line commutated converters: **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. **Three phase line commutated converters:** Working of three pulse converter and six pulse bridge converter, effect of freewheeling diode.	
Unit IV	**[06Hrs]**
Inverter: 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	**[06Hrs]**
Chopper: Principles of step down chopper, step up chopper, impulse commutated chopper, multi-phase chopper, jones chopper. **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

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr		Credits	Evaluation		
							CA	ESE	Total
22EE501P	POWER ELECTRONICS LAB	--	--	2		1	25	25	50

Course Objectives	Course Outcomes
• To introduce students to understand construction, operation and various characteristics of SCR. • To familiarize students to the different types of power semiconductor devices and their switching Operation, characteristics and performance parameters. • To understand basic operation of AC to DC conversion system. • To understand operation and application of DC to AC power conversion system with harmonic reduction methods. • Operation, switching, techniques and basics topologies of DC-DC switching	• Knowledge of different types of semiconductor switches and their characteristics • Knowledge of different types of power conversion system with their operation. • Knowledge of various rectifier circuits at loading conditions. • Knowledge of various operating modes of inverter and control circuits. • Knowledge of different DC —DC conversion circuit & four quadrant operation.

Experiment No.	Title of the experiment
1	To study V-I characteristics of SCR and measure latching and holding currents
2	Study characteristics of MOSFET and IGBT
3	Single phase Half-controlled converter with R & RL load
4	Single phase Fully controlled bridge converter with R & RL loads.
5	Single-phase AC voltage controller
6	Single-phase Cyclo converter with R& RL loads
7	Single Phase Dual converter with R load.
8	Forced commutation circuits(Class A, Class B, Class C, Class D and Class E
9	Single Phase Series Inverter with R& RL loads
10	Single Phase Parallel Inverter with R& RL loads

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

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE502P	Electrical Engineering Drawing Lab			2	1	25	25	50

Course Objectives	Course Outcomes
1. To draw and analyze electrical layouts / circuits in software's like MATLAB, PSIM and LABVIEW. 2. To evaluate the performance of electrical circuits using various network theorems.	1. To simulate and analyse electrical circuits 2. To develop electrical networks in MATLAB,PSIM and LABVIEW software 3. To model, simulate and analyze electrical circuits 4. To analyse performance of electrical networks

Expt. No.	Title of the experiment
1	To draw the standard symbols of Electrical equipment on drawing sheet.
2	To draw and simulate series RLC circuit using MATLAB- Simulink Software.
3	To draw and simulate medium transmission line model using MATLAB- Simulink Software.
4	To simulate the first quadrant chopper using PSIM Software.
5	To simulate three phase balanced and unbalance load using PSIM Software.
6	To draw three phase motor control circuit using AutoCAD Electrical software.
7	To draw motor control panel using AutoCAD Electrical software.
8	To draw and simulate control of bus voltage through on-load tap changer using virtual lab NITK, Surathkal

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

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ELECTRICAL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE503T	Electrical Machine Design	4	1		5	30	70	100

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

Unit I	**[8Hrs]**
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	**[8Hrs]**
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	**[7Hrs]**
Design of the stator core 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	**[7Hrs]**
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	**[6Hrs]**
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 for the cooling of the alternator.	

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

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE561O(i)	OE-I: MATLAB Programming	3			3	30	70	100

Course Objectives	Course Outcomes
This course is intended • To learn MATLAB computing environment • To learn MATLAB Toolboxes	**Students will be able to** • Analyze features of MATLAB development environment • Develop and Draw various plots in MATLAB • Apply knowledge of MATLAB to solve Matrices • Describe Simulink environment • Analyze various toolboxes in MATLAB

Unit I **[10Hrs]**

MATLAB Fundamentals :-Brief Introduction, Use of MATLAB, Key features, Command window, Workspace, Command history, Setting directory Working with the MATLAB user interface, Basic commands, Assigning variables, Operations with variables, Character and string, Arrays and vectors, Column vectors, Row vectors, Arithmetic operations, Operators and special characters. Mathematical and logical operators, Solving arithmetic equations, Creating rows and columns Matrix, Matrix operations, Finding transpose, determinant and inverse.

Unit II **[10Hrs]**

M files, Plots and Graphical User Interface (GUI) :-Working with script tools, Writing Script file, Executing script files, The MATLAB Editor Saving m files, Plotting vector and matrix data Plot labeling, curve labeling and editing, 2D plots, Basic Plotting Functions, Creating a Plot Plotting, Multiple Data Sets in One Graph ,Specifying Line Styles and Colors, Multiple Plots in One Figure, Controlling the Axes, 3D plots Creating, GUI Design, Introduction Of Graphical User Interface, GUI Function.

Unit III **[10Hrs]**

Introduction to Simulink :- Simulink Environment and Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model Subsystem Design, Connect Call back to subsystem.

Unit IV **[9Hrs]**

Loops, Conditional Statement and functions:- Automating commands with scripts ,Writing programs with logic and flow control, Writing functions Control statement, Programming Conditional Statement, Programming Examples, Loops and Conditional Statements, Control Flow Conditional Control — if, else, switch, Loop Control — for, while, continue, break, Program Termination — return, Functions Writing user defined functions, Built in Function, Function calling, Return Value Types of Functions

Unit V **[9Hrs]**

Study of different tool boxes of MATLAB:-

Optimization Toolbox, Fuzzy logic ,Image processing, Signal processing, Machine learning, Artificial intelligence

Text Books

S.N	Title	Authors	Edition	Publisher
1	Getting started with MATLAB	Rudra Pratap	2	Oxford
2	MATLAB and Simulink	Agam Tyagi	1	Oxford

Reference Books

S.N	Title	Authors	Edition	Publisher
1	MATLAB for Engineers	William J Palm	1	Tata Mcgraw Hill

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE561O(ii)	OE-I: PLC & SCADA Systems	3			3	30	70	100

Course Objectives	Course Outcomes
The objective of this course is to impart knowledge on the following topics- • To have the basic concept, components and programming of PLC for Automation. • To implement ladder logics for various applications. • To understand SCADA displays and its applications.	After successful completion of this course students will be able to • Identify and understand components of PLCs for Automation • Select appropriate module as per application. • Develop PLC Programming for given application. • Understand SCADA System. • Develop SCADA system for various applications.

Unit I	[10Hrs]
Introduction to PLC: Need and tools of Automation, Evolution of PLC, Architecture-PLC Block diagram and working, Selection of PLC, Types of PLCs, Advantage, limitations and applications of PLCs, Networking of PLCs.	
Unit II	**[10Hrs]**
PLC Hardware: Input and Output Modules for PLC- working, description, wiring details, specifications, interfacing; Types of Sensors, Instruction sets for given operation, Ladder Programming: Terminologies & Rules, Ladder logics for some applications, Boolean Expression to Ladder Diagram.	
Unit III	**[10Hrs]**
PLC Programming and Applications: Programming Languages for PLCs, PLC programming standard IEC61131, Relay type Instructions- Timer, Counter, Arithmetic operation, Data handling instructions. PLC based applications as motor control, traffic light, etc.	
Unit IV	**[10Hrs]**
Introduction to SCADA: Application area of SCADA; Architecture-Elements, block diagram of SCADA; Types of SCADA; Features of SCADA, MTU, RTU Functions, Communications in SCADA, Applications of SCADA.	
Unit V	**[8Hrs]**
SCADA Interfacing and Applications: Interfacing of SCADA with PLC, Creating SCADA display, Application of SCADA for ON-OFF Lamp, Traffic light control, water level control, motor control, etc.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers and Industrial Automation,	Madhuchhanda Mitra, SamarjitSen Gupta		Penram International Publishing India Pvt. Ltd
2	Supervisory Control and Data Acquisition	S.A. Boyar		, ISA Publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers	V.R. Jadhav,		Khanna Publications

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE504P	Technical Skill Development - II			2	1	50	-	50

Course Objectives	Course Outcomes
The objective of this course is to impart knowledge on the following topics- • To have the basic concept, components and programming of PLC for Automation. • To implement ladder logics for various applications. • To understand SCADA displays and its applications.	After successful completion of this course students will be able to • Identify and understand components of PLCs for Automation • Select appropriate module as per application. • Develop PLC Programming for given application. • Understand SCADA System. • Develop SCADA system for various applications.

Expt. No.	Title of the experiment
1	Basic Instructions
2	Write 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)
3	Write a simple ladder logic program to Execute Boolean expressions that uses digital inputs and outputs for a PLC.
4	Write and implementation of simple ladder logic program using timer (ON Delay Timer, OFF Delay Timer, Retentive Timer)
5	Write and implementation of simple ladder logic program using counter (Up Counter, Down Counter).
6	Write a simple ladder logic program using Math instruction.
7	Write a simple ladder logic program for Traffic Light Control System.
8	Write a simple ladder logic program for Pump ON/OFF System.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers and Industrial Automation,	Madhuchhanda Mitra, SamarjitSen Gupta		Penram International Publishing India Pvt. Ltd
2	Supervisory Control and Data Acquisition	S.A. Boyar		, ISA Publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers	V.R. Jadhav,		Khanna Publications

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(i)	PE-I: Advanced Power System	4			4	30	70	100

Course Objectives	Course Outcomes
This course is intended • To learn the various aspects of symmetrical components and various types of faults • To study concepts of power systems stability, economic scheduling and management	**Students will be able to** • Apply symmetrical components concepts in fault analysis. • Evaluate short circuit currents and system voltages for symmetrical fault • Evaluate fault current for unsymmetrical condition • Appreciate concepts of power system stability • Describe and define optimal load scheduling considering transmission losses and to solve economic dispatch problems for power system

Unit I	**[8Hrs]**
Symmetrical Component transformation: Three phase power in unbalanced circuit in terms of symmetrical component. Sequence impedances of Generator. Transformer Transmission line & Passive loads. Phase shift in Y/ delta three phase transformer (Yd1, Yd11 connection.).	
Unit II	**[6Hrs]**
Symmetrical fault analysis: Without & with pre fault load current. Selection of Circuit Breakers ratings, current limiting reactors	
Unit III	**[7Hrs]**
Unsymmetrical fault Analysis: L-G, L-L-G, L-L, open conductors faults analysis using symmetrical components	
Unit IV	**[8Hrs]**
Stability of Power System: Steady state, Dynamic and Transient stability definition. Dynamics of synchronous machine, swing equation, swing equation for machines swinging coherently and Non Coherently. Power angle equation. Steady state stability studies. **Transient stability studies:** Swing curve. Equal Area criterion for transient stability. Application of equal area criterion for different disturbances. Methods of improving transient stability.	
Unit V	**[7Hrs]**
Economic operation of Power system: Introduction, Distribution of load between units within the plant Optimum generation scheduling considering transmission losses. Representation of transmission loss using loss formula coefficient. Derivation of loss formula co-efficient. Electricity market models (Vertically integrated, Purchasing Agency, Whole-sale competition, Retails Competition)	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Elements of P.S. Analysis	William D. Stevenson	Fourth	The McGraw-Hill Company
2	Modem power System analysis	Nagrath & Kothari	Third	The McGraw-Hill Company
3	Power System Analysis	Wadhwa C.L	Fourth	New Age International Publisher

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Extra High Voltage AC. - Transmission Engineering	R D. Begamudre	Fourth	New Age International

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(ii)	PE-I: Linear Electronic Circuits	4			4	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To learn Operational Amplifiers ● To learn Linear Circuits and IC's	**Students will be able to** ● Understand basics of Operational Amplifier ● Design Linear Integrated Circuits ● Design applications of opamp ● Understand elementary idea of filter design ● Apply different IC's for signal conditioning

Unit I	**[7Hrs]**
Basics: Differential amplifier using transistors,block diagram of opamp,opamp parameters,virtual ground concept,ideal and practical opamp, equivalent circuit and voltage transfer curve.	
Unit II	**[8Hrs]**
Simple Linear Circuits: inverting,non inverting and differential configurations, integrator,differentiator	
Unit III	**[7Hrs]**
Linear Applications :-Precision Rectifier, Schmitt trigger,Wein bridge and RC phase shift oscillator,current to voltage converter,voltage to current converter	
Unit IV	**[7Hrs]**
Applications : basic bridge amplifiers,peak detector, instrumentation amplifier,active filter design with butterworth filter	
Unit V	**[7Hrs]**
Linear IC's:- D/A and A/D Conversion Circuits,IC 555 as astable multivibrator,IC 555 as monostable multivibrator,LM 723 voltage regulator	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Op-Amps and Linear Integrated Circuits	R. Gayakwad	4th	Pearson
2	Operational Amplifiers and Linear Integrated Circuits	R. Coughlin, F. Driscoll	5th	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Operational Amplifiers: Design and Applications	Tobey, Grames and Huelsman,	1st	McGraw-Hill Book Company

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(iii)	PE-I:Signals and Systems	4			4	30	70	100

Course Objectives	Course Outcomes
This course is intended • The primary objective of this course is to provide a thorough understanding and analysis of signals and systems • To learn different mathematical tools for analysis of signals & Systems	**Students will be able to** • Define & classify signals along with their mathematical representation, basic operations on signals, and their properties • Define & classify systems along with properties • Analyze periodic and aperiodic signals using Fourier Series and Fourier Transform • Analyze continuous time LTI systems using Laplace transform • Analyze and explain Sampling theory involved in analysis of signals.

Unit I	**[7Hrs]**
SIGNALS : Basics of Signals & Systems: Introduction, Continuous-Time and Discrete-Time Signals, Examples and Mathematical Representation, Classification of signals, Basic Operations on Signals, Elementary Signals, singularity functions.	
Unit II	**[8Hrs]**
SYSTEMS : Continuous-Time LTI Systems: Classification of Systems, The Convolution Integral, Properties of LTI Systems, Relations between LTI system properties and impulse response, Step response, Causal LTI Systems Described by Differential and Difference Equations, Block Diagram Representations of First-Order Systems.	
Unit III	**[8Hrs]**
FOURIER SERIES & FOURIER TRANSFORM: Fourier Series representation of periodic signals: Fourier Series Representation of Continuous-Time Periodic Signals, Representation of Aperiodic Signals: The Continuous-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, The Magnitude-Phase Representation of the Fourier Transform of LTI Systems.	
Unit IV	**[9Hrs]**
LAPLACE TRANSFORM : Representing signals by using CT complex exponentials: Laplace transforms, poles and zeros, the region of Convergence, properties of Laplace Transform, the unilateral Laplace transform, properties of the unilateral Laplace transform, Analysis and Characterization of LTI Systems Using the Laplace Transform.	
Unit V	**[4Hrs]**
SAMPLING THEORY Introduction, Representation of a Continuous-Time Signal by Its Samples, The Sampling Theorem, Impulse-Train Sampling, Sampling with a Zero-Order Hold, Reconstruction of a Signal from Its Samples	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Signals and Systems	Alan V. Oppenheim, Alan S. Willsky,	revise	Pearson Education

Reference Books

S.N	Title	Authors	Edition	Publisher
1	• B.P. Lathi, "Linear Systems & Signals", , 2004		2nd Edition	, Oxford University Press.

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(iv)	PE-I: Electrical Machines - II	4			4	30	70	100

Course Objectives	Course Outcomes
This course is intended ● To develop familiarity with Induction Machine. ● To develop familiarity with Synchronous Machine ● To lay firm foundation of electrical machines for understanding the behaviour of Power system.	**Students will be able to** ● To describe basic concept, construction, working of the Three-phase Induction Motor and different tests to be carried out for performance evaluation. ● To explain basic concept, construction, working of the Three-phase Alternator ● To analyze transient behaviour of alternator and methods of synchronization of alternator with infinite bus. ● To discuss basic concept, construction, working of the Synchronous motor and its performance evaluation ● Illustrate the awareness of various special motors along with single phase induction motors and their applications.

Unit I	**[10Hrs]**
THREE PHASE INDCTION MOTOR: Construction, Types (Squirrel Cage and Slip-ring), Starting & Maximum Torque, Torque-slip characteristics, Equivalent circuit, No load blocked rotor test, Losses & Efficiency. Method of starting, Speed control & Braking, Crawling & cogging.	
Unit II	**[10Hrs]**
THREE PHASE SYNCHRONOUS GENERATORS: Introduction, constructional features of cylindrical and salient pole rotor machines, introduction to armature winding and field windings, MMF of armature and field windings, induced EMF. Phasor diagram, Voltage Regulation	
Unit III	**[10Hrs]**
Synchronization : Synchronizing of generator with another generator, synchronizing machines on infinite bus, Parallel operation, short circuit ratio, effects of variable excitation and power input on generator operation. damper windings, power angle curve, Transient behaviour, Sudden 3-phase short circuit, time constants and equivalent circuit diagram.	
Unit IV	**[10Hrs]**
THREE PHASE SYNCHRONOUS MOTORS: Principle of operation, Phasor diagram, Torque equation, load / torque angle, effect on variable excitation and load on motor operation, V and inverted V curves, Power input and power developed equations.	
Unit V	**[8Hrs]**
Single-phase induction motors : Constructional features, double revolving field theory, Split-phase IM, Capacitor start IM, Shaded pole IM. **Special Motors :** Repulsion motor, Reluctance motor, Hysteresis motor and Universal Motor	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Machinery	Dr. P.K. Mukherjee & S. Chakraborty	2nd	Danpat Rai publication
2	Electrical Machinery	Dr. P.S. Bimbhra	3rd	Khanna publisher
3	Electrical Machines	I.S. Nagrath & Dr. D.P. Kothari	2nd	McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Elect. Machinery	Fitzogerald and Kingsley and Kusco	2nd	McGraw Hill
2	Performance & Design of A.C. M/C	M.G. Say	2nd	CBS publishers

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(iv)	PE-I: Electric Vehicle Architecture	4	-	-	4	30	70	100

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

Unit I	**[8Hrs]**
Introduction: 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	**[7Hrs]**
Electric Vehicle Modelling: 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	**[7Hrs]**
Electric Propulsion: 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	**[7Hrs]**
Energy Storage: 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	**[7Hrs]**
Power Converters: 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

		JULY 2024	1	Applicable for 2024-25
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 2024-25

ELECTRICAL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22EE505T(vi)	PE-I: PLC & Industrial Automation	4			4	30	70	100

Course Objectives	Course Outcomes
The objective of this course is to impart knowledge on the following topics- • To have the basic concept, components and programming of PLC for Automation. • To implement ladder logics for various applications. • To understand SCADA displays and its applications.	After successful completion of this course students will be able to • Identify and understand components of PLCs for Automation • Select appropriate module as per application. • Develop PLC Programming for given application. • Understand SCADA System. • Develop SCADA system for various applications.

Unit I	[10Hrs]
Introduction to PLC: Need and tools of Automation, Evolution of PLC, Architecture-PLC Block diagram and working, Selection of PLC, Types of PLCs, Advantage, limitations and applications of PLCs, Networking of PLCs.	
Unit II	**[10Hrs]**
PLC Hardware: Input and Output Modules for PLC- working, description, wiring details, specifications, interfacing; Types of Sensors, Instruction sets for given operation, Ladder Programming: Terminologies & Rules, Ladder logics for some applications, Boolean Expression to Ladder Diagram.	
Unit III	**[10Hrs]**
PLC Programming and Applications: Programming Languages for PLCs, PLC programming standard IEC61131, Relay type Instructions- Timer, Counter, Arithmetic operation, Data handling instructions. PLC based applications as motor control, traffic light, etc.	
Unit IV	**[10Hrs]**
Introduction to SCADA: Application area of SCADA; Architecture-Elements, block diagram of SCADA; Types of SCADA; Features of SCADA, MTU, RTU Functions, Communications in SCADA, Applications of SCADA.	
Unit V	**[8Hrs]**
SCADA Interfacing and Applications: Interfacing of SCADA with PLC, Creating SCADA display, Application of SCADA for ON-OFF Lamp, Traffic light control, water level control, motor control, etc.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers and Industrial Automation,	Madhuchhanda Mitra, SamarjitSen Gupta		Penram International Publishing India Pvt. Ltd
2	Supervisory Control and Data Acquisition	S.A. Boyar		, ISA Publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Programmable Logic controllers	V.R. Jadhav,		Khanna Publications

		JULY 2024	1	Applicable for 2024-25
Chairman - BoS	Dean – Academics	Date of Release	Version	

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22AS502T	English for Engineers	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
To provide students with the skills and knowledge of communication in a business environment.	**At the end of the course, students will be able to:** 1. develop an understanding of basic grammar concepts and their applications. 2. prepare and equip themselves for competitive exams 3. deliver effective presentations in a professional environment, tackle group discussions and face interviews. 4. acquire hands-on experience in writing business letters 5. display written communication in line with different workplace requirements.

Unit I : Functional Grammar	**[6Hrs]**
1. Subject-Verb Agreement 2. Preposition, Pronoun and Articles 3. Tenses 4. Direct – Indirect Speech 5. Transformation of sentences – Simple, Complex, Compound and Degrees of comparison 6. Active and Passive Voice	
Unit II : English for Competitive Exams	**[5Hrs]**
1. Sentence improvement and construction 2. Paragraph ordering 3. One word substitution 4. Verbal Analogies 5. Idioms	
Unit III : Verbal Ability	**[4Hrs]**
1. Reading Comprehension 2. Listening to Conversation (formal and Informal) and Announcements. 3. Integrated Writing – Read, and listen to a short excerpt and write a response. 4. Speaking – Podcast, Group Discussion, Presentations and Mock Interviews	
Unit IV : Formal Correspondence	**[4Hrs]**
1. Describing, summarizing, comparing graphs or illustrations 2. Basic patterns of Business Letter Writing 3. Approaches to writing – Direct, Indirect and persuasive styles. 4. Cover letter, Resume, Applications.	
Unit V : Communication at Workplace	**[5Hrs]**
1. Drafting emails and reports 2. Circular and notices. 3. Meeting etiquette and recording Minutes of the Meeting 4. Writing a Press Release	

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Functional English for Technical Student	Dr. Pratibha Mahato and Dora Thompson	2020	Himalaya Publishing House
2.	Communication Skills for Engineer	C. Muralikrishna and Sunita Mishra	2022	Pearson
3.	Effective Technical Communication	Barun K Mitra	1	Oxford University Press
4.	Basic Business Communication	Lesikar, R. & Flately	9	Tata McGraw Hill

ARISE & SHINE

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FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22H104	Foundational Humanities Elective- Development of Societies	2	-	-	-	50	--	--

Course Objectives	Course Outcomes
This course will provide a natural link between engineering and humanities.	At the end of the course, students will be able to: 1. develop a larger view of social structures and systems. 2. understand the political systems and their comparative study. 3. Aware themselves of various economic systems and sustainable development. 4. understand the interaction of political and economic strategies. 5. apply learnt concepts and generate and evaluate models of development in current context.

Unit I Social Development	**[5Hrs]**
1. Concepts behind the origin of Family, Clan and Society 2. Different Social Systems 3. Relation between Human being and Society 4. Comparative studies on different models of Social Structures and their evolution	
Unit II Political Development	**[4Hrs]**
1. Ideas of Political Systems as learnt from History 2. Different models of Governing system and their comparative study	
Unit III Economic Development I	**[4Hrs]**
1. Birth of Capitalism, Socialism, Marxism	
Unit IV Economic Development II	**[7Hrs]**
1. Concept of development in pre-British, British and post British period- Barter, Jajmani 2. E. F. Schumacher's idea of development, Buddhist economics. Gandhian idea of development. Swaraj and Decentralization	
Unit V Economic Development III	**[4Hrs]**
1. Economic Development 2. Idea of development in current context.	

S.N	Title	Authors	Edition	Publisher
1.	Sociology: Basic concepts	H.K.Rawat	2007	Rawat Publication
2.	Sociology: Themes and Perspectives	Michael Haralambos, Martin Holborn and Robin Heald	2000	Collins Educational, London, United Kingdom