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

SEMESTER III

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks				No.o f Hrs for ESE
				L	T	P		Mid-Sem Examination	Continual Assessment	End Sem Examination	Total	
1	PCC	24EE301T	Network Analysis	2	1	-	3	20	20	60	100	3
2	PCC	24EE 302T	Electrical Machines -I	3	-	-	3	20	20	60	100	3
3	PCC	24EE302P	Electrical Machines -I Lab	-	-	2	1	-	25	25	50	-
4	PCC	24EE303T	Computer Programming	3	-	-	3	20	20	60	100	3
5	PCC	24EE303P	Computer Programming Lab	-	-	2	1	-	25	25	50	-
6	PCC	24EE304T	Renewable Energy Sources	2	1	-	3	20	20	60	100	3
7	PCC	24EE304P	Renewable Energy Sources Lab	-	-	2	1	-	25	25	50	-
8	SEC	24EE341P	Career Development - III	-	-	2	1	-	50	-	50	-
9	ELC	24EE305P	Micro Project - I*	-	-	2	1	-	50	-	50	-
10	VEC	24ES401T	Economics & Management	3	-	-	3	20	20	60	100	3
11	MDM	24EE331M	Multi Disciplinary Minor - I	2	-	-	2	10	10	30	50	1.5
	Total			15	2	10	22	110	395	405	800	

*** Field Project or Community engagement project in the major discipline**

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

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

ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE301T	Network Analysis	2	1	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended • Basic circuit-solving techniques. • Different techniques for DC and AC single-phase and three-phase circuits. • Behavior of different balanced and unbalanced loads • Various mathematical tools/transformations used in circuit analysis.	Students will be able to ● Describe Kirchhoff's laws and simplify the network using reduction techniques and mesh analysis. ● Evaluate the electrical network by Nodal Analysis and simplify the network using Duality. ● Analyse the circuit using the network simplification theorems and obtain maximum power transferred to load. ● Analyse the transient response of series and parallel AC circuits and solve problems in the time domain using the Laplace transform. ● Formulate the network transfer function in the s-domain and evaluate Two Port Network Parameters and Phase-balanced and unbalanced parameters.

Unit I	**[09Hrs]**
Mesh Analysis: - Introduction to Voltage and Current dependent and independent sources, Source transformation, Mesh basis equilibrium equation, Matrix approach for complicated electrical network containing independent sources and reactance.	
Unit II	**[09Hrs]**
Nodal Analysis and Duality: - Nodal basis equilibrium equation, Matrix approach for a complicated electrical network containing independent sources and reactance, Duality.	
Unit III	**[09Hrs]**
Network Theorem: - Thevenin's, Norton's, Maximum Power Transfer and Reciprocity theorem as applied to A.C. & D.C. circuits (electrical network containing independent sources only).	
Unit IV	**[09Hrs]**
Laplace transform and properties: - Partial fractions, singularity functions, Analysis of RC, RL, and RLC network with and without initial conditions with Laplace transforms, Waveform Synthesis.	
Unit V	**[09Hrs]**
Two port network: -Definitions of Driving Point and Transfer Functions, Two Port network parameters and their interconnections,	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Network Analysis	Van Valkenburg	3rd	Pearson Education
2	Linear Network Theory	Kelkar and Pandit	39th	Pratibha Publication
3	Circuit and Network	A. Sudhakar and S. P. Shyam Mohan	2nd	Tata McGraw-Hill Education Pvt. Ltd.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Network and System	D. P. Roy Choudhary	3rd	New Age International Pvt. Ltd.
2	Electrical circuit	Del Toro		Prentice Hall
3	Electric Circuits & Network	K. Sureshkumar		Pearson Education

		June 2025	1.0	Applicable for 2025-26
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ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE302T	Electrical Machines - I	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
1. To understand 1-phase and 3-phase transformer 2. To develop familiarity with DC Generator 3. To understand basic operation of D. C. Motor	1. To explain the knowledge of the single-phase transformer and different tests to be carried out for performance evaluation 2. To illustrate the knowledge of Three-phase transformer, phasor groups and parallel connection. 3. To analyze and learn the basic concept, construction, working of the D. C. Generator and its characteristics. 4. To discuss the basic concept, working of the D. C. Motor and its characteristics.

Unit I : Single Phase Transformer	**[9Hrs]**
Revision of single phase transformer, phasor diagram, equivalent circuit, losses, Eddy current losses and Hysteresis losses, efficiency and regulation, O.C. & S.C. test, condition for maximum efficiency, all day efficiency, Sumpner's Test, parallel operation, auto transformer.	
Unit II : Three Phase Transformer:	**[9Hrs]**
Types of 3-ph Transformer, connection diagram, Scott connection, V-V connections, methods of cooling, temperature rise test, maintenance of transformer, insulation of transformer, Magnetizing current and harmonics , Polarity test, Numerical on three phase transformer.	
Unit III : DC Generator	**[9Hrs]**
Construction, Basic principle & operation, Types of Generator, Characteristics, Armature reaction & commutation, Compensating winding, interpoles, Critical field resistance, Power stages. Efficiency.	
Unit IV : D.C. Motor	**[9Hrs]**
Basis principle & operation, Types, Characteristics of shunt series & compound motor, speed control of d.c. shunt & series motor, Starting of DC motors, three point and four point starters, losses and efficiency, Applications.	
Unit V : Three Phase Induction Motor	**[9Hrs]**
Construction, Types (Squirrel Cage and Slip-ring), Rotating Magnetic field, Working Principle, Starting & Maximum Torque, Torque-slip characteristics, Power stage and Efficiency	

Text Books

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

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Elect. Machinery	Fitzogerald and Kingsley and Kusco		McGraw Hill
2	Performance & Design of A.C. M/C.	M.G. Say,		CBS publisher
3	Performance and design of DC machines	A. E. Clayton and N.N. Hancock,		CBS Publishers

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
24EE302P	Electrical Machines – I Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
1. To learn basic operation and test performed on transformer. 2. To study DC Generator and its Characteristics 3. To study DC Motor, its speed control and its Characteristics	1. To identify the tests performed on 1-phase & 3-phase transformer. 2. To identify methods of speed control og DC motor. 3. To illustrate the process of Voltage builed up in DC Generator. 4. To analyze load characteristics of DC Generator. 5. To analyze load characteristics of DC Motor

Expt. No.	Title of the experiment
1	Verification of the Transformation Ratio of Transformers
2	To Perform Open Circuit and Short Circuit Test on a Three Phase Transformer.
3	Determination of Efficiency and Voltage Regulation of a Three Phase Transformer by Direct Loading
4	To find Magnetization Characteristic of a DC Generator
5	To study the voltage build up of DC Shunt Generator
6	To Perform Load Test on DC Shunt Generator
7	Study of DC Shunt Motor Starter
8	Speed Control of D.C. Shunt Motor a) By Varying Field Current With Armature Voltage Kept Constant b) By Varying Armature Voltage With Field Current Kept Constant.
9	To Perform Load Test On D.C. Shunt Motor.
10	To Study Constructional parts of DC Machine.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Technology Volume II	B. L. Thareja		

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Laboratory Manual			
2	Laboratory Courses in Electrical Engineering	R.L. Kharbanda and S. G. Tarnekar		

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

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE303T	Computer Programming	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended • To learn the concept of programming and its related topics using C and apply it in the field of engineering and technology. • To apply programming to solve searching, sorting problems and design programs	Students will be able to ● To formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors. ● To implement conditional branching and iteration in c programming. ● To design functions, recursive functions and synthesize a complete program using divide and conquer approach. ● To use arrays to formulate and execute the algorithms. ● To analyse the pointers and structures used in c and apply them to execute the programs.

Unit I	**[09Hrs]**
Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. Arithmetic expressions and precedence.	
Unit II	**[09Hrs]**
C Programming Language: Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch Case, Loops and Writing and evaluation of conditionals and consequent branching.	
Unit III	**[09Hrs]**
Functions and Recursion: User defined and Library Functions, Parameter passing in functions, call by value and call by reference. Recursion: As a different way of solving programming problems.	
Unit IV	**[09Hrs]**
Arrays: - Arrays: 1-D, 2-D, Character Arrays. Searching, Basic Sorting Algorithms (Bubble and Selection).	
Unit V	**[09Hrs]**
Pointers and Structures: Structures, defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation).	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Programming in ANSI C	E. Balagurusamy	7th	McGraw Hill
2	Mastering C	K. R. Venugopal and S. R. Prasad	2nd	McGraw Hill
3	Programming in C	Ashok Kamthane	1st	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Let us C	Y Kanetkar	6th	BPB
2	Programming with C	Byron Gottfried	2nd	Schaums Outline Series

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE303P	Computer Programming Lab	-	-	2	1	-	25	25	50

Course Objectives	Course Outcomes
This course is intended • To learn the concept of programming and its related topics using C programming and apply it in the field of engineering and technology • To apply programming to solve searching, sorting problems and design programs.	**Students will be able to** • To formulate algorithms for arithmetic and logical problems • To test and execute the programs and correct syntax and logical errors • To implement conditional branching, iteration and recursion • To use arrays, pointers and structures to formulate algorithms and programs. • To apply programming to solve searching and sorting problems in programming.

Expt. No.	Title of the experiment
1	Write a program in C to swap contents of two integer numbers i) By using the third variable ii) Without using the third variable
2	Write a program in C to determine whether a entered year is a leap year or not using if – else statement.
3	Write a program in C to determine whether a entered number is a prime number or not.
4	Write a program in C to find factorial of a number using a function.
5	Write a program in C to find sum of digits of a number using a recursive function
6	Write a C program to add two integer numbers using pointers i) Call by Value and ii) Call by Reference
7	Write a C program to search an element in an array using Linear Search
8	Write a C program to sort an array of dimension 10 in descending order using bubble sort
9	Write a C program to find transpose of a 3 x 3 matrix using an array
10	Write a C program two multiply two matrices of dimension 3 x 3 using array
11	Write a C program to sort an array of dimension 5 in descending order using selection sort
12	Write a C program to search an element in an array using Binary Search

Text Books

S.N	Title	Authors	Edition	Publisher
1	Programming in ANSI C	E. Balagurusamy	7th	McGraw Hill
2	Mastering C	K. R. Venugopal and S. R. Prasad	2nd	McGraw Hill
3	Programming in C	Ashok Kamthane	1st	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Let us C	Y Kanetkar	6th	BPB
2	Programming with C	Byron Gottfried	2nd	Schaums Outline Series

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ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE304T	Renewable Energy Sources	2	1	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended • To learn the principles of generating Electrical energy from Renewable Energy Sources. • To gain understanding of the working of Off-grid and Grid connected Renewable Energy Generation Schemes.	**Students will be able to** **1.** Explain the fundamentals of solar radiation geometry, its measurement & estimation. **2.** Gain the knowledge of selection of sites for wind farm and their different types of wind generators. **3.** Identify renewable energy sources such as geothermal, MHD, biomass, fuel cell, tidal, ocean for generating electricity.

Unit I	**[09Hrs]**
Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation.	
Unit II	**[09Hrs]**
Solar Photovoltaic power generation: Introduction to PV cell, Construction & working, basic PV system for power generation, Characteristic of solar cell, series and parallel connection, types of solar cell, modul manufacturing, partial shading, bypass and blocking diode, different panel selection (Monocrystalline, Polycrystalline etc), Calculation of Solar rooftop setup (rating): stand alone PV system with battery and grid connected PV system with Net Metering, Introduction to MPPT.	
Unit III	**[09Hrs]**
Solar Energy Collectors: Principles of the conversion of solar radiation into heat, flat plate collectors, transitivity of cover systems, energy balance equation, concentrating collectors, comparison of concentrating and flat plate collectors. **Application of Solar Energy:** Solar water heating, space heating, space cooling, solar thermal heat conversion, Solar Cooking, Solar pumping, Solar Green Houses, Hydrogen production from Solar Energy.	
Unit IV	**[09Hrs]**
Wind Energy: Basic principles of wind energy conversion, site selection considerations, wind energy conversion system, lift and drag force, classification of wind energy conversion system (WECS), basic components of WEC system, types of wind turbine with advantages and disadvantages.	
Unit V	**[09Hrs]**
Other Renewable Energy Sources: Small scale hydro electric power generation, Energy from Biomass, Fuel cell, Geothermal Energy, Magneto hydrodynamic (MHD) power generation, **Energy from Ocean:** Ocean thermal electric conversion (OTEC), Claude & Anderson cycles, Energy from Tides & waves.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Non-conventional Energy Sources	G.D Rai	10th reprint 2002	Khanna Publishers, New Delhi
2	Non-conventional Energy Resources	B. H. Khan	2006	Tata Mc Graw hill Publishing Co. Ltd.
3	Solar Photovoltaics Fundamentals, Technologies and Applications	C. S. Solank	2011	PHI

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Renewable Energy Applications	G. N. Tiwari and M. K. Ghosal	2004	Narosa Publications
2	Energy Technology	Rao and Parulekar	2nd reprint 2002	Khanna Publishers, New Delhi

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

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE304P	Renewable Energy Sources Lab	-	-	2	1	-	25	25	50

Course Objectives	Course Outcomes
This course is intended • To learn the principles of generating Heat Energy and • Electrical energy from Renewable Energy Sources. • To gain understanding of the working of Off-grid and • Grid-connected Renewable Energy Generation • Schemes.	**Students will be able to** 1. Explain V-I characteristics of solar PV module. 2. Explain V-I characteristics of a series and parallel connected PV modules. 3. Explain effect of tilt angle on power output of module 4. Explain effect of shadow on power output of solar PV module 5. Describe biogas generation plant model set up at SVPCET Campus

Expt. No.	Title of the experiment
1	To demonstrate the I-V and P-V characteristics of PV module with varying radiation and temperature level.
2	To demonstrate the I-V and P-V characteristics of series and parallel combination of PV modules
3	To show the effect of variation in tilt angle of PV module.
4	To demonstrate the effect of shading on module output power.
5	To demonstrate the working of diode as bypass diode and blocking diode.
6	Visit to rooftop Solar Power Plant.
7	To demonstrate solar thermal water heater.
8	To find out the start up speed and cut -in speed of wind turbine experimentally.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Non-conventional Energy Sources	G.D Rai	10th reprint 2002	Khanna Publishers, New Delhi
2	Non-conventional Energy Resources	B. H. Khan	2006	Tata Mc Graw hill Publishing Co. Ltd.
3	Solar Photovoltaics Fundamentals, Technologies and Applications	C. S. Solank	2011	PHI

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Renewable Energy Applications	G. N. Tiwari and M. K. Ghosal	2004	Narosa Publications
2	Energy Technology	Rao and Parulekar	2nd reprint 2002	Khanna Publishers, New Delhi

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
24EE331M	MDM – I Basic Electrical Machines	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended to • Understand the working principles, construction, applications of single-phase transformers. • Comprehend the operation, characteristics, and applications of three-phase induction motors. • Analyze the performance and distinguish the functionalities of AC and DC motors.	**Students will be able to** • Describe the construction and working principle of a single-phase transformer with practical applications • Understand the fundamentals of 3 phase Induction Motor. • Classify different types of DC and AC motors and their applications.

UNIT 1: SINGLE PHASE TRANSFORMER	**[08Hrs]**
Construction and Working Principle, Core and shell types, operation under no-load and load conditions. EMF Equation, Ideal and practical transformer , Efficiency and Regulation.	
Unit II: Introduction to 3 Phase Induction Motor	**[08Hrs]**
Principle of Operation, Rotating magnetic field, Construction and Type , torque-slip characteristics, Starting Methods, Speed Control Methods.	
UNIT 3: DC AND AC MOTORS	**[08Hrs]**
DC Motors Types (Shunt, Series, Compound)with applications, BLDC motor, AC Motors-Single-phase induction motor: types (capacitor start/run, shaded pole) Universal motor and Servomotor motor (basic operation and applications)	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Machinery	A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans	6th Edition	McGraw-Hill Education
2	Electrical Technology, Vol. II	B. L. Thareja and A. K. Thareja	23rd Revised Edition	S. Chand & Company Pvt. Ltd.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Machinery	Dr. P.S. Bimbhra	7th Edition	Khanna Publishers.
2	Electrical Machines	D.P. Kothari, I.J. Nagrath	4th Edition	McGraw-Hill Education.