ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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

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

ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23 EE301T	Network Analysis	3	1		4	30	70	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. • Analyze the circuit using the network simplification theorems and obtain maximum power transferred to load. • Analyze 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 Mesh Analysis:	**[10 Hrs]**
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 Nodal Analysis and Duality:	**[08 Hrs]**
Nodal basis equilibrium equation, Matrix approach for a complicated electrical network containing independent sources and reactance, Duality.	
Unit III Network Theorem:	**[08 Hrs]**
Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorem as applied to A.C. & D.C. circuits (electrical network containing independent sources only).	
Unit IV Laplace transform and properties:	**[08 Hrs]**
Partial fractions, singularity functions, Analysis of RC, RL, and RLC network with and without initial conditions with Laplace transforms, Evaluation of initial condition.	
Unit V Two port network:	**[08 Hrs]**
Definitions of Driving Point and Transfer Functions, Two Port network parameters and their interconnections, Three-phase balanced and unbalanced circuits, and power calculations.	

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

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ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23EE302T	Electrical Measurement and Instrumentation	3			3	30	70	100

Course Objectives	Course Outcomes
This course is intended • To learn different instruments used for measurement of various electrical quantities. • To learn DC & AC Bridges, CT and PT, Power and Energy measurement. • To learn different instruments used for measurement of various non-electrical quantities.	**Students will be able to** • use appropriate type of measuring instrument for particular application. • calculate the value of unknown resistance, inductance, capacitance. • calculate power and energy in electric circuits. • explain transducers used for different applications. • explain measurement of various non-electric quantities.

Unit I	**[08Hrs]**
Measuring Instruments: - Principle of Galvanometer, Moving Iron (MI), PMMC and Dynamo meter type instruments (Numerical on MI and PMMC). Calibration. Loading effect of instruments, Errors in measurement (Basic Statistical analysis: Mean, Standard deviation, etc.). **Special Instruments:** Single phase Power Factor meter (any one type), Single phase Frequency meter (any one type), Synchroscope (Modified).	
Unit II	**[08Hrs]**
Measurement of RLC Elements: - Measurement of Resistance: classification, Measurement of medium resistance :- Wheatstone Bridge. Low resistance: - Kelvin's Double Bridge. High resistance: - Ohmmeter, Insulation Tester & loss of charge method. Earth resistance: - Earth tester. Balanced condition in AC Bridge, Measurement of inductance using Maxwell's inductance-capacitance bridge, Measurement of Capacitance using Schering´s, Hays bridge.	
Unit III	**[08Hrs]**
Measurement of Power and Energy: - Principle of Measurement of active, reactive and apparent power in single and poly-phase circuits. Principle of Measurement of Energy in single and poly-phase circuits. **Instrument transformers:** General theory & extension of range using CT & PT, errors in instrument transformers, applications of instrument transformers for metering.	
Unit IV	**[06Hrs]**
Digital Instruments and Transducers: - Introduction to digital meters: Measurement of voltage, current, Phase, Time. Piezoelectric transducer, Strain gauges, load cell, Seismic instruments, Accelerometer.	
Unit V	**[06Hrs]**
Measurement of Non-electric quantities: - Measurement of Temperature, measurement of torque, measurement of flow, measurement of motion and measurement of pressure.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical & Electronics Measurements & Instrumentation	A. K. Sawhney	5th revise	DHANPAT RAI & sons
2	Electronic Instrumentation & Measurement Technique	W. D. Cooper	New	Prentice Hall
3	Mechanical and Industrial Measurements	R. K. Jain	New	Khanna Publishers

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Measurement System Application and Design	E.O. Doeblin	New	Mcgraw-Hill
2	Instrumentation for Engineering Measurements	Dalley Railey, Mc Conne	New	John Wiley & Sons
3	Electrical Instrumentation	H. S. Kalsi	2nd revised	Tata Mcgraw-Hill education

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ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23 EE302P	Electrical Measurement and Instrumentation Lab			2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended • To learn different instruments used for measurement of various electrical quantities. • To learn DC & AC Bridges, CT and PT, Power and Energy measurement. • To learn different instruments used for measurement of various non-electrical quantities.	**Students will be able to** • measure unknown resistance using DC Bridges and loss of charge method. • measure value of unknown capacitance and inductance using AC bridges. • measure electrical power using watt-meter. • measure electrical power using CT & PT. • measure non-electrical quantity using suitable transducer.

Expt. No. (Any 08)	Title of the experiment (Any 08)
1	Measurement of Low resistance using Kelvin Double Bridge.
2	Measurement of high resistance by loss of charge method.
3	Measurement of medium resistance using Wheatstone Bridge.
4	To determine the Inductance of unknown coil by Maxwell's bridge.
5	To determine the Capacitance of an unknown Capacitor by Schering Bridge.
6	To determine the Inductance of unknown coil by Hay's bridge.
7	To determine electrical power by two watt-meter method.
8	Measurement of electrical power using CT and PT.
9	Study of single phase energy meter.
10	Study of Resistance Temperature Detector.
11	Measurement of displacement using LVDT.
12	Study of measurement of Torque.
13	Measurement of pressure using Bourdon Tube.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical & Electronics Measurements & Instrumentation	A. K. Sawhney	5th revise	DHANPAT RAI & sons
2	Electronic Instrumentation & Measurement Technique	W. D. Cooper	New	Prentice Hall
3	Mechanical and Industrial Measurements	R. K. Jain	New	Khanna Publishers

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Measurement System Application and Design	E.O. Doeblin	New	Mcgraw-Hill
2	Instrumentation for Engineering Measurements	Dalley Railey, Mc Conne	New	John Wiley & Sons
3	Electrical Instrumentation	H. S. Kalsi	2nd revised	Tata Mcgraw-Hill education

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23EE303T	Electronics Devices and Circuits	3	1	-	4	30	70	100

Course Objectives	Course Outcomes
This course is intended * To introduce basic electronic circuit made up of diodes and transistors. * To understand analysis and design of basic digital circuits and linear integrated circuits	Students will be able to ● Explain basic applications of diodes. ● Describe basic applications of transistor. ● Analyse & classify basic digital electronics. ● Identify basic digital circuits ● Explain basic analog circuits

Unit I Basic diode and its applications	**[7Hrs]**
Zener diode voltage regulator,p-n junction diode clipping and clamper circuits,HWR and full wave bridge rectifier with and without C-filter	
Unit II Basic transistor and its applications	**[6Hrs]**
Npn BJT working,input and output characteristics of CE configuration,Transistor as a switch,Transistor as an amplifier CE configuration (all npn)	
Unit III Basics of digital electronics	**[7Hrs]**
Number system and conversion,binary addition and subtraction by ones and twos compliment method,binary,BCD,gray codes conversions,basic gate (AND,OR,NOT), Universal gate (NAND,NOR), special gate(EXOR EXNOR),Boolean algebra theorems De Morgans proof,classification of digital logic families TTL,CMOS and ECL	
Unit IV Basic digital circuits	**[8Hrs]**
K-map upto 4-variables,combinational and sequential circuits,half and full adder,half and full subtracter,decoder and encoder ICs,code converters,one bit memory cell,latch and flip flop,SR ,D,JK,T flip flops,JK master slave flip flop	
Unit V Basic analog circuits	**[8Hrs]**
Block diagram of an op-amp,pin out of IC741,various parameters and definitions ideal and non ideal ,open loop,close loop,inverting,non inverting and differential configurations,concept of virtual short and ground	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electronic principles	V.K.Mehta	XII	S.Chand
2	Digital Circuits	Anand Kumar	IV	PHI
3	Operational Amplifiers	Ramakant Gaikwad	IV	PHI

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Integrated Electronics, ,	J. Millman, C. Halkias,	4 th Edition,	Mc-Graw Hill Education
2	Fundamentals of Digital Circuits	R.Tinder	2 nd Edition	Wiley

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23EE303P	Electronics Devices and Circuits Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended ● To understand the basic applications of diodes and transistors. ● To summarize and apply the basic concepts of digital circuits and analog circuits.	**Student will able to** ● Develop diode circuits on bread board. ● Verify working of transistor circuits. ● Study basic digital circuits and basic analog circuits

Expt. No.	Title
1	To perform Zener diode voltage regulator on breadboard.
2	To perform diode clipping and clamping circuits.
3	To perform input and output characteristics of CE configuration.
4	To perform transistor as an amplifier.
5	To implement nand gate using descrete components.
6	To verify the truth tables of basic gates ,universal gates and special gates.
7	To perform half and full adder.
8	To perform inverting amplifier.

Text Books

S. N	Title	Authors	Edition	Publisher
1	**Electronics laboratory primer**	S.Poornachandra	2nd	S.Chand
2	Electronics & communication	B.Sasikala	2nd	Vikas

Reference Books

S. N	Title	Authors	Edition	Publisher
1	Integrated Electronics, ,	J. Millman, C. Halkias,	4 th Edition,	Mc-Graw Hill Education
2	Fundamentals of Digital Circuits	A. Anand Kumar,	4 th Edition,	PHI Learning Pvt. Ltd.

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THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23 EE304T	Renewable Energy Sources	3			3	30	70	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** ● Explain the fundamentals of solar radiation geometry, its measurement & estimation. ● Gain the knowledge of selection of sites for wind farm and their different types of wind generators. ● Identify renewable energy sources such as geothermal, MHD, biomass, fuel cell, tidal, ocean for generating electricity.

Unit I	**[10Hrs]**
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	**[10Hrs]**
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	**[10Hrs]**
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	**[10Hrs]**
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	**[8Hrs]**
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.	

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. Solanki	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	Grid integration of wind energy conversion systems	H. Siegfried and R. Waddington	2006	John Wiley and Sons Ltd.
3	Energy Technology	Rao and Parulekar	2nd reprint 2002	Khanna Publishers, New Delhi

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23 EE304P	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** ● Explain V-I characteristics of solar PV module. ● Explain V-I characteristics of a series and parallel connected PV modules. ● Explain effect of tilt angle on power output of module ● Explain effect of shadow on power output of solar PV module ● Describe biogas generation plant model set up at SVPCET Campus

Expt. No.	Title of the experiment
1	To study V-I characteristics of solar PV module.
2	To study V-I characteristics of a series connected PV modules
3	To study V-I characteristics of a parallel connected PV modules
4	To study Effect of tilt angle on power output of module.
5	To study Effect of shadow on power output of solar PV module.
6	To study Solar energy based battery charger
7	To study Wind energy based battery charger
8	Design of solar PV system for home

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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. Solanki	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	Grid integration of wind energy conversion systems	H. Siegfried and R. Waddington	2006	John Wiley and Sons Ltd.
3	Energy Technology	Rao and Parulekar	2nd reprint 2002	Khanna Publishers, New Delhi

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23ES301T	Value Education Course -I	2	-	-	2		35	50

Course Objectives	Course Outcomes
This course is intended ● To develop a holistic perspective through self-exploration and development of clarity about harmony between self, family, society and nature.	**Students will be able to** ● demonstrate awareness about concepts like self exploration & natural acceptance. ● understand concepts of aspirations and happiness. ● develop clarity of harmony and health in human being. ● discuss concepts of conservation of nature and harmony in nature/existence and re-usability.

Unit I : Introduction to Self-Exploration **[6Hrs]**

- Purpose & motivation for studying universal human values.
- Self-Exploration–what is it? - Its content and process.
- 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.

Unit II: Understanding Happiness and Prosperity **[6Hrs]**

- Understanding Happiness and Prosperity correctly.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility.
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit III: Understanding Harmony in human being **[6Hrs]**

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of 'I' and harmony in 'I'.
- Understanding the harmony of I with the Body: Sanyam and Health.

Unit IV: Co-existing with nature **[6Hrs]**

- Understanding the harmony in Nature.
- Interconnection and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Coexistence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Pollution, depletion of resources and role of technology.

Text Books

Sr.No.	Title	Authors	Edition	Publisher
1	Human Values and Professional Ethics	Gaur, Sangal, Bagaria	2010	Excel Books, New Delhi

Reference Books

Sr.No.	Title	Authors	Edition	Publisher
1	Jeevan Vidya: Ek Parichaya	A. Nagaraj	1999	Jeevan Vidya Prakashan, Amarkantak
2	Human Values	A.N. Tripathi	2004	New Age Intl. Publishers, New Delhi
3	The Story of My Experiments with Truth	M.K.Gandhi	2009	Fingerprint! Publishers

Online Resources

1	https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php
2	https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23EE306P	Micro Project-I			2	1	50		50

Course Objectives	Course Outcomes
This course is intended • To enable the Students to undertake short research projects and fabricate it.	**Students will be able to** • explain fabrication work of project set up / devices or developed software.

S.N.	Project
1	**Projects are based on :** Recent Trends in Electrical Power System, Power Electronics and Renewable Energy.

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ELECTRICAL ENGINEERING

THIRD SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23EE331M	MDM-I: Basic Electrical Machines	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
This course is intended to • To apply the basic Electrical Engineering fundamentals to understand the working principle of Electrical Machines. • To understand construction, operation and applications of Electrical machines.	**Students will be able to** • Understand the fundamentals of DC Generator. • Understand the fundamentals of 3 phase Induction Motor. • Understand the fundamentals of 1 phase Induction Motor .

Unit I: DC Generator	**[08Hrs]**
Construction, Basic principle & operation, Types of Generator, Characteristics, Armature reaction & commutation, Compensating winding, interpoles, Critical field resistance, Power stages. Efficiency	
Unit II: Introduction to 3 Phase Induction Motor	**[08Hrs]**
Construction, Basic principle & operation, Types of 3 Phase Induction Motors, Characteristics, power stages, Efficiency. Applications.	
Unit III: Introduction to 1 Phase Induction Motor	**[08Hrs]**
Construction, Basic principle & operation, Types of 1 Phase Induction Motors. Applications.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Machinery	Dr. P.K. Mukherjee & S. Chakraborty	-	Rai publication
2	A Text Book of Electrical Technology	B. L. Thareja and A. K. Thareja	-	S. Chand Publication (Volume I, II & III)

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Electrical Machinery	Fitzgerald and Kingsley and Kusco	-	McGraw Hill Publications.
2	Performance & Design of A.C. M/C	C M.G. Say	-	CBS Publishers.