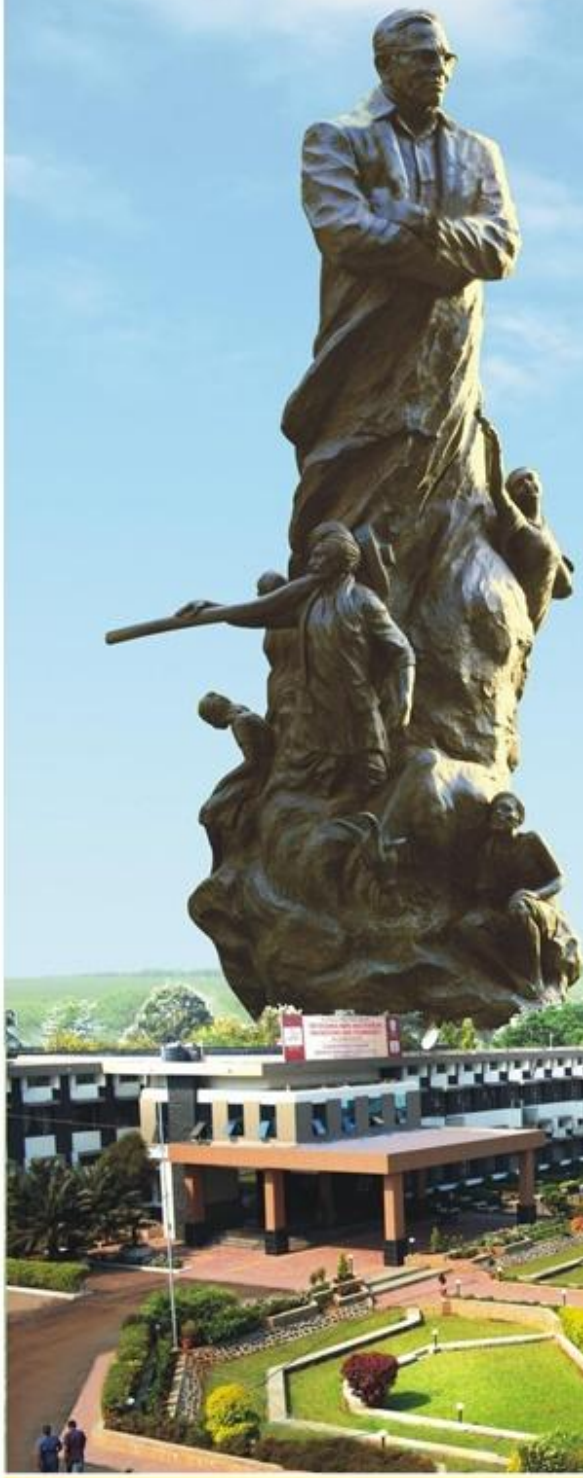
An Autonomous Institute

Shree Warana Vibhag Shikshan Mandal's

Tatyasaheb Kore Institute of Engineering And Technology, Warananagar

NBA Accredited Institute



Department of Electrical Engineering

(Draft Syllabus of Electrical Engineering)

Syllabus for S.Y.B.Tech.

B. Tech. in Electrical Engineering

Proposed Structure and Syllabus under Autonomy as per the NEP Policy 2020

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Department of Electrical Engineering

❖ Vision

To become an academy of excellence in technical education and human resource development.

❖ Mission

- To develop engineering graduates of high repute with professional ethics.
- To excel in academics and research through innovative techniques.
- To facilitate the employability, entrepreneurship along with social responsibility.
- To collaborate with industries and institutes of national recognition.
- To inculcate lifelong learning and respect for the environment.

❖ Quality Policy

To promote excellence in academic and training activities by inspiring students for becoming competent professionals to cater industrial and social needs.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates will be able:

[1] To excel in technical education and research in Department of Electrical Engineering.

[2] To make the graduate competent with recent technological development in related field.

[3] To enable the graduates to innovate, design and develop new Electrical Engineering systems.

[4] To provide excellent academic environment for life - long learning.

[5] To embed the Professional and ethical approach, effective communication and team work.

PROGRAM OUTCOMES:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SWVSM'S

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Abbreviations

Sr.No.	Acronym	Definition
1	ISE	In-Semester Examination
2	ISE-I	In-Semester Examination-I
3	ISE-II	In-Semester Examination-II
4	ESE	End Semester Examination
5	ISA	In-Semester Assessment(Term Work)
6	L	Lecture
7	T	Tutorial
8	P	Practical
9	CH	Contact Hours
10	C	Credit

Course/Subject Categories

Sr. No.	Acronym	Definition
1	PCC	Professional Core Course
2	MDM	Multidisciplinary Minor
3	OE	Open Electives
4	HSSM	Humanities social science and Mgmt
5	ELC	Experiential Learning Courses
6	VSEC	Vocational and skill Enhancement course
7	AEC	Ability Enhancement Course

Course/Subject Code

ET	E	3	0	1
Branch Code		Semester	Course Number	

Course Term work and POE Code

ET	E	3	0	1	T/P/A
Branch Code		Semester	Course Number		T- Term Work P-POE A-Audit Course

Second Year B. Tech.

In Electrical Engineering

Structure and Syllabus under Autonomy as per the NEP Policy 2020

2025-26

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Electrical Engineering)

Semester-III

(To be implemented from 2025 - 26)

Credit Scheme as per NEP 2020 Policy

Sr. No,	Category	Sub Category	Course Code	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	Programme Course	PCC	25UGPCC - EE301	Engineering Mathematics for Electrical Engineers	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
2		PCC	25UGPCC-EE302	Electrical Circuit Analysis	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
3		PCC	25UGPCC-EE303	DC Machine & Transformer	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
4		PCC	25UGPCC-EE304	Electrical Measurement and Instrumentation	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
5	Multi-disciplinary Courses	MDM-1	25UGMDM1 - EE305	Multi-Disciplinary Minor-1	2	--	--	2	2	ISA	50	20	20
6	Humanities Social Science and Management	Entrepreneurship/Economics/ Management Courses	25UGEEC1-EE306	Management Concepts and Techniques	3	--	--	2	3	ESE	60	24	40
										ISE	40	16	
7		Value Education Course (VEC)	25UGVEC1-EE307	Introduction to Constitution of India	2	--	--	2	2	ISA	50	20	20
8	Experiential Learning Courses	Comm. Engg. Project (CEP)/Field Project (FP)	25UGCEP EE308	Mini project	-	--	2	1	2	ISA	50	20	20
9		PCC	25UGPCC - EE302LP	Electrical Circuit Analysis Lab	--	-	2	1	2	ISA	25	10	10
										POE	25	10	10
10		PCC	25UGPCC-EE303LP	DC Machine & Transformer Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
11		PCC	25UGPCC-EE304LP	Electrical Measurement and Instrumentation Lab	--	--	2	1	2	ISA	25	10	10
12		PCC	25UGPCC-EE309L	Electrical Maintenance and Trouble shooting	-	-	2	1	2	ISA	25	10	10
					19	0	10	21	29	--	800	320	320

***Additional contact hours are provided for the courses without any credit**

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Electrical Engineering)

Semester-IV

(To be implemented from 2025 -26)

Credit Scheme as per NEP Policy

Sr. No.	Category	Sub Category	Course Code	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	Programme course	PCC	25UGPCC - EE401	Analog and Digital Electronics	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
2		PCC	25UGPCC - EE402	AC Machine	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
3		PCC	25UGPCC - EE403	Power Transmission and Distribution System	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4	Multi-disciplinary Courses	MDM-2	25UGMDM 2 - EE404	Multi-Disciplinary Minor-2	2	--	--	2	2	ISA	50	20	20
5		OE-1	25UGOE1 - EE4051	Open Elective (OE) -1	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
6	Skill course	Vocational and Skill Enhancement Course (VSEC)	25UGVSEC-EE406	MATLAB for Electrical Engineers Lab	-	--	2	1	2	ISA	50	20	20
7	Humanities Social Science and Management	Ability Enhancement Course	25UGAEC1 - EE407	Indian Language	2	-	--	2	2	ISA	25	10	10
8		Entrepreneurship/Economics/ Management Courses	25UGEEC2 - EE408	Effective Technical Communication	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
9		Value Education Course (VEC)	25UGVEC2 - EE409	Universal Human Values	2*	--	--	1	2	ISA	50	20	20
10	Programme course	PCC	25UGPCC - EE403LP	Power Transmission and Distribution-I Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
11		PCC	25UGPCC - EE401LP	Analog and Digital Electronics Lab	--	--	2	1	2	ISA	25	10	10
12		PCC	25UGPCC - EE402LP	Electrical Machines-II Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
13	AUDIT COURSE	A	25UGAC - EE410A	Environmental studies	---	--	--	--	--	--	--	--	--
					21	00	8	21	29	--	800	320	320

***Additional contact hours are provided for the courses without any credit**

Multidisciplinary Courses (MDM) offered by Electrical Engineering Department

MDM Basket Name	Sr. No.	Course Code	Course Name	Semester
Electrical Power System	1.	25UGMDM1-EE306L	Electrical Power Generation	III
	2	25UGMDM2-EE405L	Power System	IV
	3	25UGMDM3-EE505L	Electrical Machines	V
	4	25UGMDM4-EE606L	Solar and Wind Energy Conversion System	VI
	5	25UGMDM5-EE705L	Smart Grid	VII

Program Elective-I

Sr. No.	Course Code	Domain	Course
1	25UGPEC1-EE5041	Power and Energy Systems	Energy Storages Technologies
2.	25UGPEC1-EE5042		Electrical Estimation & costing
3.	25UGPEC1-EE5043	Drives and Control	Electric Vehicles Technology
4.	25UGPEC1-EE5044		Electrical Utilization and Traction

Program Elective-II

Sr. No.	Course Code	Domain	Course
1	25UGPEC2-EE6041	Power and Energy Systems	Electrical Energy Conservation and auditing
2.	25UGPEC2-EE6042		Battery Management Systems
3.	25UGPEC2-EE6043	Drives and Control	Advanced Control Systems
4.	25UGPEC2-EE6044		Application of Microcontrollers in Electrical Engineering

Program Elective-III

Sr. No.	Course Code	Discipline	Course
1	25UGPEC3-EE6051	Power and Energy Systems	Power Systems Dynamics and Control
2	25UGPEC3-EE6052		HVDC Transmission Systems
3	25UGPEC3-EE6053	Drives and Control	Power System Operation and Control
4	25UGPEC3-EE6054		Nonlinear Control Systems

Program Elective-IV- Theory

Sr. No.	Course Code	Discipline	Course
1	25UGPEC4-EE7031	Power and Energy Systems	High Voltage Engineering
2	25UGPEC4-EE7032		Restructured Power System
3	25UGPEC4-EE7033	Drives and Control	Industrial automation (PLC & SCADA)
4	25UGPEC4-EE7034		Solar Energy Conversion System

Program Elective-V- Theory

Sr. No.	Course Code	Discipline	Course
1	25UGPEC5-EE7041	Power and Energy Systems	Wind Energy Conversion Systems
2	25UGPEC5-EE7042		Power Quality and Harmonics
3	25UGPEC5-EE7043	Drives and Control	FACTS Controllers
4	25UGPEC5-EE7044		Smart Grids

Program Elective-V- Lab

Sr. No.	Course Code	Discipline	Course
1	25UGPEC5-EE7041LP	Power and Energy Systems	Wind Energy Conversion Systems Lab
2	25UGPEC5-EE7042LP		Power Quality and Harmonics Lab
3	25UGPEC5-EE7043LP	Drives and Control	FACTS Controllers Lab
4	25UGPEC5-EE7044LP		Smart Grids Lab

Open Elective Course

Sr. No.	Course Code	Course Name	Semester	Offered by Department
1.	25UGOE1-EE4061	Energy Auditing and Management	IV	Electrical Engineering
2	25UGOE1-EE4062	Solar Energy Conversion System	IV	
3	25UGOE2-EE5061	Wind Energy Conversion System	V	
4	25UGOE2-EE5062	Electric Vehicles Technology	V	

25UGPCC-EE301- ENGINEERING MATHEMATICS FOR ELECTRICAL ENGINEERS

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to:	
1	To develop Mathematical skills and enhance thinking power of students.
2	To give the knowledge to the students of Linear Differential Equations, Laplace transforms, Fourier series, Fourier Transform, Probability, Vector Differential Calculus with an emphasis on the application of solving Engineering Problem.
3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Use of Linear Differential Equations and vector differentiation to find directional derivatives, curl and divergence of vector field.	Understanding, Application
CO2	Use Laplace and Inverse Laplace to solve linear differential equations	Understanding
CO3	Develop Fourier series expansion & Fourier Transform of a function over the given interval	Understanding, Application
CO4	Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.	Applying

Description:

Engineering Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are typically used in engineering to solve complex engineering problems. This course has six units namely i) Linear Differential Equations (LDE) and its applications ii) Vector Differential Calculus iii) Laplace Transform and Inverse Laplace Transform and its Applications iv) Fourier Series v) Fourier Transform vi) Probability Distribution.

Prerequisites:	1	Trigonometric identities and Logarithmic identities.
	2	Differentiation and integration formulae.
	3	Basic knowledge of probability.

Course Contents		
Unit No:1	**Linear Differential Equations and its applications:** 1. Linear Differential equation with constant coefficients. 2. Rules to find complementary function. 3. Methods to find particular Integral. 4. Applications of linear differential equations with constant coefficients to Electrical Engineering.	**7 Hrs.**
Unit No:2	**Vector Differential Calculus:** 1. Differentiation of vectors. 2. Gradient of scalar point function. 3. Directional derivatives. 4. Divergence of vector point function. 5. Curl of a vector point function. 6. Irrotational, Solenoidal and Scalar potential function of a vector field	**7 Hrs.**
Unit No:3	**Laplace Transform:** 1. Laplace transform of elementary functions. 2. Properties of Laplace transform. 3. Inverse Laplace transform. 4. Properties of Inverse Laplace transform. 5. Application of Laplace transform.	**7 Hrs.**
Unit No:4	**Fourier Series:** 1. Definition, Euler's formulae, Dirichlet's conditions. 2. Fourier Series of periodic function. 3. Change of interval. 4. Expansions of odd and even functions. 5. Half range series.	**7 Hrs.**
Unit No:5	**Fourier Transform:** 1. Definition, Fourier Transform. 2. Fourier Sine and Cosine Integral. 3. Fourier sine and Cosine transform. 4. Inverse Fourier sine and Cosine transform, Properties.	**7 Hrs.**
Unit No:6	**Probability Distribution:** 1. Basic definitions, Conditional probability 2. Random variables. 3. Discrete Probability distribution. 4. Continuous probability distribution. 5. Binomial Distribution. 6. Poisson Distribution. 7. Normal Distribution.	**7 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1										1			
CO2	2	1										1			
CO3	2	1										1			
CO4	2	1										1			

Text Books:	
1	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, Inc,10th Edition, 2017.
2	Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, 44th Edition, 2017.

Reference Books:	
1	Higher Engineering Mathematics, B. V. Ramanna, Tata McGraw Hill Education Pvt. Ltd, 1st Edition 2007.
2	Advanced Engineering Mathematics, H. K. Dass, S. Chand and company Ltd., 1st Edition 1988
3	An Introduction to probability and Statistics, V. K. Rohatgi, Wiley Publication, 2nd Edition 2008

25UGPCC- EE302- ELECTRICAL CIRCUIT ANALYSIS

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	This course intends to develop an understanding of the fundamental laws and elements of electric circuits.
2	It will make students to learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
3	The course intends to introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Determine voltages, currents, powers, and equivalence of a.c. and d.c. circuits using electrical circuit theorems.	Understanding
CO2	Calculate the transient and steady state response of first and second order circuits.	Applying
CO3	Analyze the parameters of two port electrical circuits and networks.	Applying
CO4	Solve complex electric circuits using network theorems.	

Description:

This course aims to discuss the basic concepts of network analysis, which is the pre-requisite for all the Electrical Engineering courses. The course deals with different methods of network reduction and network representations useful for analysis of different complex R-L-C circuits. The course enabls students to design the resonant circuits, filters.

Prerequisites:	1	1. Basic Concepts of electrical circuit Theorem. 2. Basic Concepts of integral differential equations 3. Basic Concept of network.

Course Contents		
Unit No:1	**Basic Circuits Analysis:** Ideal voltage and current sources, dependent and independent sources, Fundamentals concepts of R, L, C, M elements, nodes, branches, loops, voltage and current division, Ohm's Law, source transformation, Wye Delta transformations, Kirchhoff 's Laws, , Node and Mesh analysis (Numerical Treatment)	**6Hrs.**
Unit No:2	**Network Theorem and Topology:** Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem, Incidence Matrix, fundamental loop Matrix (Numerical Treatment)	**6Hrs.**
Unit No:3	**Power in AC Circuits:** Instantaneous and Average Power, Maximum Average Power, RMS Value, Apparent Power and Power factor, Complex Power, mutual inductance, dot convention, energy in coupled circuits.	**6Hrs.**
Unit No:4	**Transient Analysis:**: Transient response of DC and AC networks, sinusoidal steady-state analysis, Behavior of circuit elements under switching action, Evaluation of initial and final conditions., Resonant Circuits, Resonant frequency.	**6Hrs.**
Unit No:5	**Three Phase System:** Three phase balanced and unbalanced system, analysis of three phase circuit, calculation of real and reactive power, complex power and power factor in AC circuits. (Numerical Treatment)	**6Hrs.**
Unit No:6	**Two Port Network**: Impedance parameters, admittance parameters, hybrid parameters, transmission parameters, series connection of two-port network, parallel connection of two two-port network, cascade connection of two two-port network (Numerical Treatment)	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1			2	1	3				
CO2	2	2	1	2	3	1			2	2	2				
CO3	3	2	2	1	2	1			2	2	2				
CO4	3	2	1	2	1	1			2	1	1				

Text Books:	
1	"Fundamentals of Electric Circuits", C. K. Alexandar and M.O. Sadiku, McGraw Hill EducationMH, 6th Edition,2018, ISBN: 9780078028229

Reference Books:	
1	"Circuit & Network- Analysis & Synthesis", A. Sudhakar, Shyammohan, S. Palli, IIInd Edition Tata McGraw Hill Publication (Unit II,IV, VI).
2	"Engineering Circuit Analysis", "Hayt, Kemmerly, Durbin, TMH, 8th Edition, 2012, ISBN: 9781259098635
3	"Electric Circuits" ,James W. Nilsson and Susan A. Riedel Prentice Hall, 10th Edition, 2015, ISBN: 0131989251

PCC	25UGPCC -EE302LP	**Electrical Circuit Analysis Lab**

Practicals : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 25 Marks

Experiment List

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	Verification of Mesh analysis method.	2	Understanding
2.	Verification of Node analysis method.	2	Understanding
3.	Verification of Thevenin's theorem	2	Understanding
4.	Verification of Superposition theorem.	2	Understanding
5.	Verification of Norton's theorem.	2	Understanding
6.	Verification of Maximum Power Transfer theorem.	2	Understanding
7.	Determination of active, reactive, and apparent power for balanced three phase star connected inductive / capacitive load.	2	Evaluate
8	Determination of active, reactive, and apparent power for unbalanced three phase star connected inductive / capacitive load.	2	Evaluate
9.	Determine of Y and Z parameter of the two port network	2	Evaluate
10.	Determination of Hybrid and transmission parameter	2	Evaluate

(Note: Minimum 8 experiment should be performed)

25UGPCC- EE303 – DC Machine & Transformer

Lectures : 3 Hrs./Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	This course intends to provide basic concept of DC machines and transformers
2	It intends to develop skills to evaluate ratings of DC machines and transformers for various applications.
3	It intends to solve problems on DC machines and transformers.
4	This will help students to understand applications of special purpose motors.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the Construction and working principles of DC machines, and transformers	Understanding (II)
CO2	Describe the operation of special purpose machines	Understanding (II)
CO3	Solve the numerical problems on DC machines and single phase transformers	Applying (III)
CO4	Analyses the performance of three phase transformers	Analyzing (IV)

Description:

The course aims at giving the fundamentals of energy conversion in electromechanical systems, covers details of construction and operation of dc machines in monitoring and generating modes. This course also deals with the construction and operation of single phase and three phase transformer.

Prerequisites:	1	Basic Physics, Fundamentals of Electrical Engineering

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Course Contents		
Unit No:1	**DC Machines:** Constructional Details: Construction of D.C. machines, EMF equation, power flow diagram of D.C. machines. Armature Winding: Simple lap winding and wave winding, Armature Reaction: MMF due to armature winding, flux distribution due to armature current and resultant flux distribution in a machine. Demagnetization and cross magnetization ampere turns, principle of compensation, compensating winding and its use in machines.	**6Hrs.**
Unit No:2	**D.C. Motors:** Types of DC Motors, Concept of back e.m.f., characteristics of D.C. motors, Method of speed controls, Losses and efficiency, Break load test, Swinburn's test, Hopkinson's test. **(Numerical Treatment)**	**6Hrs.**
Unit No:3	**Special purpose motors:** Universal motor, DC Servomotors, Permanent magnet DC motors, Stepper motors, Applications.	**6Hrs.**
Unit No:4	**Single Phase Transformer:** Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters (O.C./S.C. test). **(Numerical Treatment)**	**6Hrs.**
Unit No:5	**Transformer Testing:** Testing of transformer as per IS, polarity test, Sumpner's test and equivalent delta test. Calculation of efficiency. Autotransformer: Construction, Operation, Applications. **(Numerical Treatment)**	**6Hrs.**
Unit No:6	**Three phase transformer:** Construction, single phase bank, polarity test, transformer winding, V-V connection and Scott connection, Parallel operation of three phase transformer, Three winding transformer.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1											2	1	
CO2		3	3	2	2				1			1	1		
CO3		3		1	1										
CO4		2		1	1										

Text Books:	
1	Ashfaq Husain, Haroon Ashfaq "Electric Machines", Dhanpat Rai and Co, 3rd Edition, 2018.
2	J. B. Gupta, "Theory and Performance of Electrical Machines", S. K. Kataria and Sons, 1st Edition, 2013.

Reference Books:	
1	“Electric Machines”, Kothari and Nagrath, McGraw Hill, 5th Edition, 2018
2	“Electrical Machines”, Purkait and Bandyopadhyay Oxford University Press, 1st Edition, 2017.
3	“Electrical Machines”, Purkait and Bandyopadhyay Oxford University Press, 1st Edition, 2017.

PCC	25UGPCC -EE303LP	**DC Machine & Transformer Lab**

Practicals : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 25 Marks

Experiment List

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	To study electrical machine lab	2	Understanding
2.	Speed torque characteristics of D.C. shunt motor.	2	Apply
3.	Speed control of D.C. shunt motor using Armature control method.	2	Apply
4.	Speed control of D.C. shunt motor using flux control method.	2	Apply
5.	Testing the performance of D.C. Shunt generator by Hopkinson's Test	2	Apply
6.	Brake test on D.C. series motor.	2	Apply
7.	Reversals of rotation of D.C. shunt motor and series motor	2	Understanding
8.	Open circuit and short circuit test on single phase transformer to determine equivalent circuit parameters.	2	Evaluate
9	Perform polarity test on a single phase transformer whose polarity markings are masked.	2	Evaluate
10.	Scott-Connection of three phase transformer.	2	Understanding

(Note: Minimum 8 experiment should be performed**)**

25UGPCC-EE304–Electrical Measurement and Instrumentation

Lectures : 3Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40Marks
ESE : 60Marks

Course Objectives: The course aims to :	
1	Understand the errors encountered in measuring instruments. Derive the balance conditions in AC and DC bridges for the measurement L, C, R and dissipation factor etc.
2	To analyse the working of analogue and digital measuring instruments, and determine the necessary conditions for working of instrument transformers.
3	To analyse the working principles of signal generators used in the laboratories
4	To distinguish and describe various transducers and display devices used in instrumentation.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the working of various meters used for measurement of Power, Energy & understand the adjustments, calibration & errors in energy meters.	Understand
CO2	Understand the different measurement errors and analyse different digital instruments and their working.	Understand
CO3	Measure resistance, inductance and capacitance using bridges and determine earth resistance	Apply
CO4	Assess the performance of different measuring instruments.	Analyze
CO5	Analyze and interpret different signal generator circuits for the generation of various waveforms and also to understand the use of different display devices.	Analyze

Description:		
The course deals with the working of instruments used for measurement of various electrical quantities.		
Prerequisites:	1	Basic knowledge of Electrical engineering , Engineering Physics, Electrical circuit Analysis

Course Contents		
UnitNo:1	**Measuring Instruments (AC and DC):** Introduction, ammeter, voltmeter, extending voltmeter range, AC voltmeter using Rectifiers – Half wave and full wave, Definition of error, Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures. *(Numerical Treatment)*	**6Hrs.**
UnitNo:2	**Measurement of Power, Energy, Power factor** Dynamometer wattmeter construction and working principle, Induction type energy meter: construction and operation. Construction and operation of single phase and three phase dynamometer type power factor meter. phase sequence indicator.	**6Hrs.**
UnitNo:3	**Bridges:** Wheatstone's bridge, Kelvin Bridge; AC bridges - Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Schering bridge, D'sautys bridge. *(Numerical Treatment)*	**6Hrs.**
UnitNo:4	**a) Instrument Transformers:** Construction and theory of instrument transformers, ratio and phase angle errors of C.T. and P.T. **b) Digital Instruments:** Introduction, digital voltmeters (DVM) of ramp type, successive approximation principles, resolution and sensitivity, Digital Mustimeters, ADC and DAC.	**6Hrs.**
UnitNo:5	**Signal Generators and Analyzers:** Introduction, Fixed and variable AF oscillator, standard signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.	**6Hrs.**
UnitNo:6	**Display Devices:** Digital display system, classification of display, Display devices, LEDs, LCD.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1										1			
CO2	3	3	3		1					1		1			
CO3	3	3	3	2	1					1		1			
CO4	3	3	3	2	1					1		1			
CO5	3	3	2	2								1			

TextBooks:	
1	A.K. Sawhney, “Electrical and electronic Measurements and Instrumentation”, 10th Edition, Dhanpat Rai and Co, 2015
2.	R K Rajput, “Electrical and Electronic Measurements and Instruments”, 3rd edition, S Chand, 2013

Reference Books:	
1	J. B. Gupta, “A Course in Electronics and Electrical Measurements and Instrumentation”, 13th edition, Katson Books, 2008
2	David A Bell, “Electronic Instrumentation and Measurements”, 2nd Edition, PHI, 2006
3	Cooper D & A D Helfrick, “Modern electronic instrumentation and measuring techniques”, edition, PHI, 1998

PCC	25UGPCC -EE304LP	**Electrical Measurement and Instrumentation Lab**

Practicals : 2 Hrs/Week **Evaluation Scheme**
Credit : 1 **ISA** : 25 Marks

List of Experiment

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	Identification of measuring instruments on the basis of symbols on dial, type, accuracy, class, position and scale.	2	Remember
2.	Measurement of power in a single-phase circuit using electrodynamic watt-meter.	2	Apply
3.	To study about the potential transformer and find its transformation ratio.	2	Understand
4.	To study about the current transformer and find its transformation ratio.	2	Understand
5.	One wattmeter method of measurement of active and reactive power in a three-phase balanced load.	2	Apply
6.	Two watt-meters method of measuring active power in a three phase balanced load.	2	Apply
7.	Measurement of medium and high resistance using bridges.	2	Apply
8.	Measurement of displacement using LVDT.	2	Apply
9	Measurement of temperature using RTD.	2	Understand
10.	Measurement of supply voltage, frequency, peak value in single phase circuit using CRO/DSO.	2	Apply /

25UGMDM1- EE305- Electric Power Generation

Lectures : 2 Hrs/Week
Credit : 2

Evaluation Scheme
ISA : 50 Marks

Course Objectives: The course aims to :	
1	Understand the components, layout, and working principles of different types of power stations, including thermal, nuclear, gas, and hydroelectric.
2	Analyze and classify distribution systems and calculate voltage drops in D.C. distribution networks.
3	Identify and compare different types of substations and their layouts, including air-insulated and gas-insulated substations.
4	Apply economic principles to evaluate power generation cost, load curves, and tariff structures.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the fundamental concepts of energy sources like conventional and nonconventional energy.	Understanding (II)
CO2	Describe various advantages and disadvantages of energy sources.	Understanding (II)
CO3	Illustrate different technology associate with thermal, hydro and nuclear power sources.	Illustrate (L3)
CO4	Illustrate different technology associate with solar, wind, biomass and other renewable energy sources.	Illustrate (L3)

Description:		
The course contains detailed information about different power station, load curve, different types of substation, generation cost.		
Prerequisites:	1	Basic knowledge of Electrical engineering

Course Contents		
Unit No:1	**Energy Scenario:** Present energy scenario worldwide and Indian perspective, concept of energy services, India's production, need for non-conventional energy sources, advantages and disadvantages.	**6Hrs.**
Unit No:2	**Hydroelectric Power Stations:** Elements of hydroelectric power station-types-concept of pumped storage plants-storage requirements, estimation of power developed from a given catchment area, Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine.	**6Hrs.**
Unit No:3	**Thermal Power Plant:** Law of thermodynamics, layout of power plant and coal handling plant, selection of site, boiler, impulse turbine and reaction turbine, economizer, air preheater, super heater, condenser and cooling tower	**6Hrs.**
Unit No:4	**Nuclear Power Plant:** Fundamentals of nuclear power, layout of nuclear power plant, selection of site, radioactivity and nuclear reactions, nuclear fission chain reaction in reactors, reactor safety and security.	**6Hrs.**
Unit No:5	**Solar Energy:** Solar radiation, flat plate collectors, solar concentration, photovoltaic technology and application	**6Hrs.**
Unit No:6	**Wind Energy:** Wind characteristics, resource assessment, horizontal and vertical axis wind turbines, principle of wind energy conversion, wind energy economics, electricity generation and water pumping.	**6 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1													
CO2		3													
CO3				2											
CO4		2													

Text Books:	
1	“Energy Techonology: Non-conventional, Renewable and Conventional”, Rao S. and Parulekar, B.V, Khanna Publishers.
2	“Non-conventional Energy Sources”, Rai, G.D., Khanna Publishers.
3.	“Electrical Power Systems”, “C. L. WadhawaNew age International (P) Limited, Publishers 1997.

Reference Books:	
1	“Elements of Power Station design and practice” , “M.V. Deshpande”, Wheeler Publishing, 3rd Edition 1999.
2	“Electrical Power Generation, “S. N. Singh”, Transmission and Distribution”, PHI, 2003.
3	“Principles of Power Systems”, “V.K Mehta and Rohit Mehta”, S. Chand& Company Ltd, New Delhi, 2004.

25UGEEC1-EE3061 - MANAGEMENT CONCEPTS & TECHNIQUES

Lectures	**: 3**Hrs/Week	**Evaluation Scheme**
Credit	**: 2**	**ISE:** 40 Marks
		ESE : 60 Marks

Course Objectives:	
The course aims :	
1	To familiarize the students with the concepts of Management
2	To relate the concepts of management with industrial organizations
3	To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy Level**
CO1	**Explain** the concepts of Management	Understand
CO2	**Show** basic understanding of management and to relate the concepts of management with industrial organizations and manage organizations efficiently	Remember
CO3	**Explain** the basic knowledge of production management and make decisions proficiently	Understand
CO4	**Summarize** the knowledge in maintaining better human relations in the organizations	Understand

Description:		
Electrical engineers are expected to work during most of their career at middle level. They are also expected to deal with workforce and management problems. In the present era of competition, optimum utilization of the resources with achieving higher productivity is essential for any industry to survive. Quality and cost controls are also other important factors which contribute to the day to day supervision issues.		
Prerequisites:		Knowledge of English Communication and Discipline Courses

Course Contents		
Unit No:1	**Introduction:** Concept of Management, Scope and Nature of Management, Approaches to Management, Human Relation, Behavioural and System approach.	**6 Hrs.**
Unit No:2	**Management:** Functions of management – Planning, Organizing, Staffing, Directing Controlling and Coordinating, Levels of management, Role of Manager, Skills of manager, – F.W. Taylor's scientific management and Henry Fayol's principles of management	**6 Hrs.**
Unit No:3	**Organization:** Meaning of Organization, Principles of organization, Departmentalization, **Communication**: Importance, purpose and forms of communication. Barriers to communication	**6 Hrs.**
Unit No:4	**Forms of business organizations**: Salient features of Sole proprietorship, Partnership, Joint Stock Company, Private limited company and Public limited company, Government enterprises and Co-operative societies	**6 Hrs.**
Unit No:5	**Production operations management:** Production planning and control, Plant location and factors affecting plant location, Plant layout and types of layout (in brief).	**6 Hrs.**
Unit No:6	**Human Resources Management:** Basic functions of human resource management. Manpower planning, Recruitment, Selection, Training and Development, Placement, Compensation and Performance appraisal.	**6 Hrs.**

Mapping of POs & COs:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO		
													PSO1	PSO2	PSO3
CO1	3	2	1		1									1	
CO2	3	2		1	2										
CO3	3	3	1		2										2
CO4	2	1													1

Text Books:	
1	"Principles of Management" , P.C. Tripathi, P.N.Reddy, Fourth Edition, Tata Mc Graw Hill Companies, New Delhi (2008) (Units Covered 1,2)
2	"Managerial Economics and Financial Analysis", A.R. AryaSri, TMH Publications, new Delhi, (2014) (Units covered – 3)
3	"Industrial Organization & Engineering Economics", S.C. Sharma and Banga T. R.,khanna Publications, Delhi-6. (2006) (Units covered – 4,5)

Reference Books:	
1	“Industrial Engineering and Management”, O.P. Khanna, Dhanpat Rai and Sons.

	List of learning websites :
	1. www.youtube.com/watch?v=SF53ZZsP4ik **2. www.youtube.com/watch?v=iPZlQ3Zx5zc**

25UGVEC1-EE307- INTRODUCTION TO CONSTITUTION OF INDIA

Lectures	**:**	02 Hrs/Week	**Evaluation Scheme**		
Credit	**:**	02	**ISA**	**:**	50 Marks

Course Objectives: The course aims to :	
1	A basic understanding of Constitution of India.
2	Builds the ability to apply the knowledge gained from the course to current social legal issues.
3	Ability to understand and solve the contemporary challenges
4	Understanding constitutional remedies.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	**Explain** the significance of Indian Constitution as the fundamental law of the land	Understanding
CO2	Exercise his fundamental rights in proper sense at the same time **Interprets** his responsibilities in national building.	Understanding
CO3	**Explain** the Indian political system, the powers and functions of the Union, State and Local Governments in detail	Understanding
CO4	**Summerize** Electoral Process, provisions and Amendment procedure.	Understanding

Description:

This Course is an introduction of Indian Constitution and basic concepts highlighted in this course for understanding the Constitution of India. This course is structured to give a deeper insight for making the nexus between the other law subjects.

Prerequisites:	1	Basics of Indian History, Independence Movement, Fundamentals of Civics.

Course Contents		
Unit:1	**Constitution-Structure and Principles** 1.1: Meaning and importance of Constitution 1.2: Making of Indian Constitution-Sources 1.3: Salient features of Indian Constitution	**4 Hrs.**
Unit:2	**Fundamental Rights and Directive Principles** 2.1: Fundamental Rights & Fundamental Duties2.2: Directive Principles of State Policy	**4 Hrs.**
Unit:3	**Union Government & Executive** 3.1: President of India - Qualification, Powers and Impeachment 3.2: Lok Sabha & Rajya Sabha Sabha- Composition, Powers & Functions, Scope to amendment in Constitution	**4 Hrs.**
Unit:4	**State Government & Executive** 4.1: Govemor - Qualification, Appointment, Powers & Functions 4.2: Legislative Assembly & Legislative Council -Composition, Powers & Functions	**4 Hrs.**
Unit:5	**The Judiciary** 5.1: Features of Judicial System in India 5.2: Hierarchy of Courts, Composition and Jurisdiction	**4 Hrs.**
Unit:6	**Local Self Government and other constitutional Organizations** 6.1: 73rd and 74th Constitutional Amendments 6.2: Public Service Commission, Election Commission, CAG, National Commissions for SC, ST etc.	**4 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1						3		3				3			
CO2						3		3	3	3		3			
CO3						3			3			3			
CO4						3			3			3			

Text Books:	
1	"Indian Constitutional Law", by M.P. Jain,

Reference Books:	
1	Constitution of India (Full Text), India.gov.in., https://www.india.gov.in/sites/upload files/npi/files/coi_part_full.pdf
2	"Introduction to the Constitution of India", by Durga Das Basu.
3	"The Constitutional Law of India", by J.N. Pandey.

25UGPCC-EE309L- Electrical Maintenance and Trouble shooting

Practicals : 02 Hrs/Week
Credit : 01

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	A basic understanding of Constitution of India.
2	Builds the ability to apply the knowledge gained from the course to current social legal issues.
3	Ability to understand and solve the contemporary challenges
4	Understanding constitutional remedies.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate safe practice to prevent electrical accidents while handling electrical tool/ equipment.	Understanding
CO2	List of tools/ instruments for installation and to generate technical reports.	Remember
CO3	Demonstrate various tests as per IS on electrical equipment/ machines.	Understanding
CO4	Prepare maintenance schedule of different equipment/machines.	Understanding
CO5	Develop trouble shooting chart for various electrical equipment, machines & domestic appliances.	Apply

Description:

This course covers the fundamentals and techniques of troubleshooting and maintenance of electrical equipment and connections. Electrical Power system consists of a number of transformers, circuit breakers and other equipment which require installation, commissioning and regular maintains to prevent permanent breakdown.

Prerequisites:	1	Theory and hands on practices with: Basic Electrical Engineering, Fundamentals of Electrical Machines, Fundamentals of Electronics, Analog and Digital Electronics, Electrical Measurements.

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Unit No.	Course Contents	Hrs.	Blooms Taxonomy
1.	Introduction to electrical instruments used in maintenance and troubleshooting.	2Hrs.	Understand
2	Demonstration of the action to be taken during an electrical accident	2Hrs	Understand
3	Undertake mock drill operation using fire extinguisher and demonstration of fire extinguishing system.	2Hrs	Apply
4	Measure insulation resistance of winding/cables/ electrical equipment.	2Hrs	Apply
5	Prepare plate/pipe/ rod earthing and conduct earth testing as per IS.	2Hrs	Apply
6	Troubleshooting of ceiling fan & fluorescent and LED tube light.	2Hrs	Analyze
07	Prepare plate/pipe earthing as per IS	2Hrs	Apply
08	Study battery charger and make charging of lead acid battery	2Hrs	Apply
09	Cutting copper and aluminum cable and crimping lug to them from $4mm^2$ to $25mm^2$ cross section	2Hrs	Apply
10	Prepare maintenance schedule of induction motor and power transformer	2Hrs	Create

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Electrical Engineering)

Semester-IV

(To be implemented from 2025 -26)

Credit Scheme as per NEP Policy

Sr. No.	Category	Sub Category	Course Code	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	Programme course	PCC	25UGPCC - EE401	Analog and Digital Electronics	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
2		PCC	25UGPCC - EE402	AC Machine	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
3		PCC	25UGPCC - EE403	Power Transmission and Distribution System	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4	Multi-disciplinary Courses	MDM-2	25UGMDM 2 - EE404	Multi-Disciplinary Minor-2	2	--	--	2	2	ISA	50	20	20
5		OE-1	25UGOE1 - EE4051	Open Elective (OE) -1	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
6	Skill course	Vocational and Skill Enhancement Course (VSEC)	25UGVSEC-EE406	MATLAB for Electrical Engineers Lab	-	--	2	1	2	ISA	50	20	20
7	Humanities Social Science and Management	Ability Enhancement Course	25UGAEC1 - EE407	Indian Language	2	-	--	2	2	ISA	25	10	10
8		Entrepreneurship/Economics/ Management Courses	25UGEEC2 - EE408	Effective Technical Communication	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
9		Value Education Course (VEC)	25UGVEC2 - EE409	Universal Human Values	2*	--	--	1	2	ISA	50	20	20
10	Programme course	PCC	25UGPCC - EE403LP	Power Transmission and Distribution-I Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
11		PCC	25UGPCC - EE401LP	Analog and Digital Electronics Lab	--	--	2	1	2	ISA	25	10	10
12		PCC	25UGPCC - EE402LP	Electrical Machines-II Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
13	AUDIT COURSE	A	25UGAC - EE410A	Environmental studies	---	--	--	--	--	--	--	--	--
					21	00	8	21	29	--	800	320	320

25UGPCC- EE401- ANALOG AND DIGITAL ELECTRONICS

Lectures : 3Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40Marks
ESE : 60Marks

Course Objectives: The course aims to :	
1	This course intends to develop an understanding of the fundamental laws and elements of electric circuits.
2	It will make students to learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
3	The course intends to introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Interpret characteristics of diodes, transistors and MOSFET	Understanding
CO2	Analyze various analog circuits	Applying
CO3	Design operational amplifier based circuits	Applying
CO4	Design combination and sequential logic circuits	Applying

Description:		
The course has been designed to introduce fundamental principles of analog and digital electronics. This course focuses on construction, working and characteristics of electronic devices such as diode, zener diode, BJT, and FET. It contains combinational and sequential logic circuits.		
Prerequisites:	1	1. Basic Concepts of electronics 2. Basic Concepts of power electronics 3. Basic Concept of network.

Course Contents		
UnitNo:1	**Diode and Its Applications: Introduction to** P-N junction diode, clippers and clamper circuits, zener diode, mathematical modeling of diode.	**6Hrs.**
UnitNo:2	**BJT & MOSFET:** BJT- Construction and operation of transistor, BJT configuration, I-V characteristics of a BJT, biasing circuits, BJT as a switch, BJT as an amplifier, MOSFET- construction and operation of MOSFET, drain & transfer characteristics, biasing circuits, MOSFET as a switch.	**6Hrs.**
UnitNo:3	**Operational Amplifiers and Its application:** Ideal op-amp, inverting and non-inverting amplifier, integrator & differential amplifiers, adders, sub-tractor, V to I converters, Zero crossing detector, Schmitt-trigger.	**6Hrs.**
UnitNo:4	**Fundamentals of Digital System & Logic Families:** Number systems, number system conversion, Boolean algebra, binary arithmetic, 1's and 2's complements arithmetic, codes, digital logic families, logic gates.	**6Hrs.**
UnitNo:5	**Combinational Logic circuits:** K-Map representation, minimization of logic functions using K-Map, adders, sub-tractors, comparator, Multiplexer, De-Multiplexer, encoder/decoder.	**6Hrs.**
UnitNo:6	**Sequential Logic circuits:** Sequential 1-bit memory, latch, S-R flip-flop, J-K flip-flop, T Flip-flop, D flip-flops, Master slave J-K flip flop, characteristic equation and application of flip-flop.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1	2	1	3	1			2	1	3				
CO2	2	2	1	2	3	1			2	2	2				
CO3	3	2	2	1	2	1			2	2	2				
CO4	3	2	1	2	1	1			2	1	1				

Text Books:	
1	Robert L.Boylestad Louis Nashelsky, Electronic devices & circuit theory, Pearson.
2	Ramakant Gaikwad, OP-AMP and Linear integrated circuits, PHI
3	R.P.Jain, Modern Digital Electronics, Tata McGraw Hill

Reference Books:	
1	Donald Neamen, Electronic Circuits, Analysis and Design, McGraw Hill
2	Sergio Franco , Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill
3	Leach & Malvino, Digital Principles & Application. McGraw Hill

PCC	25UGPCC –EE401LP	**Analog and Digital Electronics Lab**

Practicals : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25

Experiment List:

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	Operation of clipper and clamper circuits	2	Apply
2.	Testing of power MOSFET.	2	Apply
3.	Verification of truth table of AND, OR, NOT gates using ICs.	2	Understand
4.	Verification of operation of Multiplexer IC 74151.	2	Apply
5.	Verification of operation of De-multiplexer IC 74155.	2	Apply
6.	Testing the function of RS flip flop using NAND Gate.	2	Apply
7.	Testing the function of JK flip flop using 7476.	2	Apply
8.	Operation of step-up chopper.	2	Apply
9	Verification of inverting and non-inverting amplifier	2	Apply
10.	Charge controller in PV system	2	Understand

25UGPCC - EE402- AC Machines

Lectures	**:**	3 Hrs/Week	**Evaluation Scheme**
Credit	**:**	2	**ISE : 40 Marks**
			ESE : 60 Marks

Course Objectives: The course aims to :	
1	This course intends to provide details of operation and performance of asynchronous and synchronous machines
2	It intends to develop application skills to operate asynchronous and synchronous machines.
3	It intends to develop a skill to determine asynchronous and synchronous machines

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the Construction and working principles of induction motor	Understanding (II)
CO2	Evaluate characteristics parameters of Induction Motor using different tests	Analyzing (IV)
CO3	Explain the construction and operation and performance of Synchronous Generator.	Understanding (II)
CO4	Explain the construction and operation of induction motor	Understanding (II)

Description:		
The course contains detailed information about construction, working, testing and controlling of AC machines.		
Prerequisites:	1	Basic knowledge of Electrical engineering

Course Contents		
Unit No:1	**Single Phase Induction Motor:** Double revolving field theory, starting & running performance of 1-phase induction motor, equivalent circuit, types of single phase motors	**6Hrs.**
Unit No:2	**Three-phase induction machines:** Principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control	**6Hrs.**
Unit No:3	**Application and testing of Three Phase Induction Motor:** Construction, principle of operation, phasor diagram, equivalent circuit, analysis based on approximate equivalent circuit, Torque equation, speed equation, speed torque curve. No load blocked rotor test, circle diagram.	**6Hrs.**
Unit No:4	**Synchronous Generator:** Construction, Principle of operation, EMF equation, leakage reactance, armature reaction, armature resistance and reactance, field excitation system, damper winding, Hunting of synchronous machines and its prevention.	**6Hrs.**
Unit No:5	**Synchronous Motors:** Method of starting, phasor diagram, torque and torque angle equation, v-curves and experimental setup, hunting and damping, synchronous condenser.	**6Hrs.**
Unit No:6	**Performance and testing of Synchronous Generator:** Determination of voltage regulation by Synchronous impedance method, MMF method, ZPF method, Synchronization, importance and methods, parallel operation, load sharing between parallel connected.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1													
CO2		3													
CO3				2											
CO4		2													

Text Books:	
1	“Electric Machines:, I.J. Nagrath and D.P. Kothari, McGraw Hill Education, 2010
2	“ Principle of Electric Machines”, V K Mehta, S Chand Publication
3.	“Performance Design of AC Machines”, M.G. Say, CBS Publishers, 3rd Edition

Reference Books:	
1	“Electric Machines”, J.B. Gupta, S K Kataria and Sons, New Delhi.
2	“Electrical Machine”, J. Chapman, McGraw Hill, 5th Edition, 2009.
3	“Electric Machine”, Fitzerald and Kingsley, Tata McGraw Hill, 2nd Edition, 2000.

PCC	25UGPCC -EE402LP	**AC Machine Lab**

Practicals : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 25 Marks

Experiment List:

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	Identification of different parts of a three phase squirrel cage and slip ring induction motor, interpretation of the nameplate of three phase induction motor and reversal of the direction of rotation	2	Understand
2.	Brake test on three-phase induction motor.	2	Apply
3.	Measurement of iron and copper losses through no-load and blocked rotor test on a three-phase induction motor and calculation of efficiency	2	Apply
4.	Speed control of a three-phase slip ring induction motor by varying rotor resistance.	2	Apply
5.	V and inverted V curve test on synchronous motor	2	Apply
6.	Direct loading of synchronous motor	2	Apply
7.	Starting and controlling the speed of a three-phase induction motor using variable frequency drive (VFD)	2	Apply
8.	Identification of different parts of a single phase induction motor and reversing the direction of rotation of a ceiling fan/ single phase induction motor/ universal motor	2	Understand

25UGPCC - EE403- Power Transmission and Distribution System

Lectures	**:**	3 Hrs/Week	**Evaluation Scheme**
Credit	**:**	2	**ISE : 40 Marks**
			ESE : 60 Marks

Course Objectives: The course aims to :	
1	Understand the components, layout, and working principles of different types of power stations, including thermal, nuclear, gas, and hydroelectric.
2	Analyze and classify distribution systems and calculate voltage drops in D.C. distribution networks.
3	Identify and compare different types of substations and their layouts, including air-insulated and gas-insulated substations.
4	Apply economic principles to evaluate power generation cost, load curves, and tariff structures.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the layout and components of thermal, nuclear, gas, and hydroelectric power stations.	Understanding (II)
CO2	Analyze and compute voltage drops in various D.C. distribution systems, and evaluate the suitability of system types.	Applying (L3)
CO3	Compare air-insulated and gas-insulated substations based on design, construction, and operation.	Analyzing (L4)
CO4	Evaluate load curves and tariff structures, and solve numerical problems related to economic aspects of power generation	Applying (L3)

Description:

The course contains detailed information about different power station, load curve, different types of substation, generation cost.

Prerequisites:	1	Basic knowledge of Electrical engineering

Course Contents		
Unit No:1	**Structure of Electrical Power systems:** Structure of electrical Power system, different factors associated with generating stations such as connected load, maximum demand, demand factor, average load, load factor, diversity factor, plant capacity factor, reserve capacity, plant use factor, load curve. **(Numerical Treatment)**	**6Hrs.**
Unit No:2	**Mechanical design of overhead lines:** Main components of overhead lines, different conductor materials, different insulator, string efficiency, methods of improving string efficiency, corona and factors affecting corona, sag in overhead lines. **(Numerical Treatment)**	**6Hrs.**
Unit No:3	**Electrical Design of overhead lines:** Resistance of a transmission line, inductance of a single/three phase lines, skin, proximity and Ferranti effects in power system	**6Hrs.**
Unit No:4	**Cables and Power factor:** Construction and classification of cables, cable laying and grading of cables, Power triangle, power factor and improvement technique	**6Hrs.**
Unit No:5	**Supply System:** AC and DC transmission systems and its comparison. Different systems of power transmission. Comparison of conductor material required in AC and DC systems, Economics of power transmission	**6Hrs.**
Unit No:6	**Distributions Systems:** Classification of distribution systems, types of DC distributors, power loss calculations, AC distribution system.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1			1					1					
CO2	3	3			1					1					
CO3	3			2	1					1					
CO4	3	2													

Text Books:	
1	"Generation and utilization of Electrical Energy", "C. L. Wadhawa", New age International (P) Limited, Publishers 1997.
2	"A Text Book on Power System Engineering" ,"M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti", , Dhanpat Rai and Co. Pvt. Ltd, 1999.
3.	"Electrical Power Systems", "C. L. WadhawaNew age International (P) Limited, Publishers 1997.

Reference Books:	
1	“Elements of Power Station design and practice” , “M.V. Deshpande”, Wheeler Publishing, 3rd Edition 1999.
2	“Electrical Power Generation, “S. N. Singh”, Transmission and Distribution”, PHI, 2003.
3	“Principles of Power Systems”, “V.K Mehta and Rohit Mehta”, S. Chand& Company Ltd, New Delhi, 2004.

PCC	25UGPCC -EE403LP	**Power Transmission and Distribution System Lab**

Practicals : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 25 Marks

Experiment List

Sr. No.	Name of Experiment	Hrs.	Blooms Taxonomy
1.	To study the Power System blocks in MATLAB.	2	Understand
2.	To design short and long transmission line using MATLAB.	2	Apply
3.	To study the corona loss in power distribution system.	2	Understand
4.	To obtain the ABCD parameters of 220KV transmission line model.	2	Apply
5.	To determine the string efficiency of an insulator string used in transmission line.	2	Apply
6.	To study different type of lightening arrestor.	2	Understand
7.	To study performance characteristics of typical DC distribution system in radial & ring main configuration.	2	Understand
8.	To study the proximity and skin effect.	2	Understand
9	To study the corona loss in power distribution system.	2	Analyze
10.	Study of corona discharge.	2	Understand

25UGMDM2-EE404 - POWER SYSTEM

Lectures : 2 Hrs/Week
Credit : 2

Evaluation Scheme
ISA : 50 Marks

Course Objectives: The course aims to :	
1	To learn the basic structure of electrical power systems, various electrical terms related with power system and understand various types of tariffs.
2	To understand the specifications and applications of various major electrical equipment present in power plant
3	To understand the specification and applications of various major electrical equipment present in power plant
4	To learn representation of transmission lines for performance evaluation.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Recognize different patterns of load curve and calculate associated different factors with it and tariff.	Understanding (II)
CO2	Design electrical and mechanical aspects in overhead transmission and underground cables	Create (L4)
CO3	Evaluate the parameter of the transmission line configurations	Create(L4)
CO4	Analyze the performance of short and medium transmission lines.	Performance (L4)

Description:		
The course contains deliberates the various aspects of tariff in power system, key emphasis on transmission and distribution of electrical power.		
Prerequisites:	1	Basic knowledge of Electrical engineering

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Course Contents		
Unit No:1	**Structure of Electrical Power systems:** Structure of electrical Power system, different factors associated with generating stations such as connected load, maximum demand, demand factor, average load, load factor, diversity factor, plant capacity factor, reserve capacity, plant use factor, load curve,	**6Hrs.**
Unit No:2	**Mechanical design of overhead lines:** Main components of overhead lines, different conductor materials, different insulator, string efficiency, methods of improving string efficiency, corona and factors affecting corona, sag in overhead lines	**6Hrs.**
Unit No:3	**Electrical Design of overhead lines:** Resistance of a transmission line, inductance of a single/three phase lines, skin, proximity and Ferranti effects in power system	**6Hrs.**
Unit No:4	**Cables and Power factor:** Construction and classification of cables, cable laying and grading of cables, Power triangle, power factor and improvement technique	**6Hrs.**
Unit No:5	**Economic Aspects of Power Generation:** Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.	**6Hrs.**
Unit No:6	**Distribution Systems:** Classification of distribution system, types of DC distribution, power loss calculation, ac distribution system.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	3	3		1					1					
CO3	3	3	3	2	1					1					
CO4	3	3	3	2	1					1					

Text Books:	
1	“Principles of Power Systems”, V.K.Mehta, S.Chand
2.	“Generation and utilization of Electrical Energy”, “C. L. Wadhawa”, New age International (P) Limited, Publishers 1997.
3.	“A Text Book on Power System Engineering” ,“M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti”, , Dhanpat Rai and Co. Pvt. Ltd, 1999.
4.	”, “Electrical Power Systems”, “C. L. Wadhawa New age International (P) Limited, Publishers 1997.

Reference Books:	
1	“Elements of Power Station design and practice” , “M.V. Deshpande”, Wheeler Publishing, 3rd Edition 1999.
2	“Electrical Power Generation, “S. N. Singh”, Transmission and Distribution”, PHI, 2003.
3	“Electric Power Transmission and Distribution”, Pearson, S. Sivangaraju and Satyanarayana

25UGOE1-EE4051– SOLAR ENERGY CONVERSION SYSTEM

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	To learn the basic structure of solar energy conversion systems, various electrical terms related with system and understand various types of pv module
2	To understand the specifications and applications of various major electrical equipment present in solar system
3	To understand the specification and applications of various major solar system in renewable energy sources
4	To learn the installation of Installation, Trouble Shooting and Safety.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Recognize different stages of the solar energy conversion system	Understanding (II)
CO2	Design and Measuring PV Module Parameters.	Create (L4)
CO3	Understand the Maximum Power Point Tracking	Understanding (II)
CO4	Analyze the performance of Solar PV System.	Performance (L4)

Description:		
The course contains deliberates the various aspects of tariff in power system, key emphasis on transmission and distribution of electrical power.		
Prerequisites:	1	Basic knowledge of Electrical engineering

Course Contents		
Unit No:1	**Basics of Electricity**: Voltage, Current, DC Power, AC Power, Energy, Harmonics, Solar Radiation, Net Metering, Measurement of Electrical and Non Electrical Quantities.	**5Hrs.**
Unit No:2	**Solar Photovoltaic:** Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters.	**6Hrs.**
Unit No:3	**Solar Photovoltaic Module Array:** Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module.	**5Hrs.**
Unit No:4	**Charge Controller**: MPPT and Inverter, Power MOSFET and IGBT, Opto coupler, Buck and Boost Converter, Fly back Converter, Full Bridge Inverter, Voltage and Current Feedback, DC to DC power converter, DC to AC Converter, AC to DC Converter, Battery Charge controller, Maximum Power Point Tracking, Specification of Inverter and charger.	**7Hrs.**
Unit No:5	**Solar PV System Design and Integration:** Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant.	**7Hrs.**
Unit No:6	**Installation, Trouble Shooting and Safety:** Installation and Troubleshooting of Standalone Solar PV System, Maintenance of Solar PV System, Safety in installation of Solar PV System, Maintenance of Solar PV System.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	3	3		1					1					
CO3	3	3	3	2	1					1					
CO4	3	3	3	2	1					1					

Text Books:	
1	"Principles of Power Systems", V.K.Mehta, S.Chand
2.	"Generation and utilization of Electrical Energy", "C. L. Wadhawa", New age International (P) Limited, Publishers 1997.
3.	"A Text Book on Power System Engineering" ,"M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti", , Dhanpat Rai and Co. Pvt. Ltd, 1999.
4.	", "Electrical Power Systems", "C. L. WadhawaNew age International (P) Limited, Publishers 1997.

Reference Books:	
1	"Elements of Power Station design and practice" , "M.V. Deshpande", Wheeler Publishing, 3rd Edition 1999.
2	"Electrical Power Generation, "S. N. Singh", Transmission and Distribution", PHI, 2003.
3	"Electric Power Transmission and Distribution", Pearson, S. Sivangaraju and Satyanarayana

25UGOE1-EE4052–Energy Audit Management

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40Marks
ESE : 60Marks

Course Objectives: The course aims to :	
1	To introduce the fundamentals of energy, its various forms, and the importance of energy conservation and management in industry and buildings
2	To provide knowledge about different types of energy audits, audit procedures, and the roles and responsibilities of energy managers and auditors
3	To impart knowledge on thermal energy systems such as boilers, furnaces, and steam systems, and explore methods to enhance their efficiency.
4	To familiarize students with renewable energy technologies, sustainable energy practices, and their integration into existing energy systems for environmental benefits.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the principles of energy management and the role of energy audits in optimizing energy use.	Understand
CO2	Analyze energy consumption in electrical systems and recommend methods for improving electrical efficiency.	Analyze
CO3	Conduct energy performance assessments using appropriate tools and measurement techniques.	Apply
CO4	Perform economic analysis of energy-saving projects using financial metrics like payback period, NPV, and IRR.	Apply
CO5	Discuss the integration of renewable energy technologies and sustainable practices in energy management.	Analyze

Description:

This course introduces the principles and practices of energy management and auditing in industrial, commercial, and residential settings. It covers energy conservation techniques, efficiency improvement strategies for electrical and thermal systems, and performance assessment tools. Students will learn how to conduct energy audits, use measurement instruments, analyze energy usage data, and evaluate energy-saving projects economically. The course also emphasizes the role of renewable energy and sustainable development in modern energy systems

Prerequisites:	1	**Thermodynamics** – Understanding of energy, heat transfer, and basic thermodynamic cycles. **Electrical Machines or Basic Electrical Engineering** – Familiarity with electrical systems, motors, transformers, and power factor **Instrumentation and Measurement**) – Basic knowledge of instruments used to measure energy, temperature, pressure, etc.

Course Contents		
UnitNo:1	**Introduction to Energy Management and Auditing:** Basics of energy – forms, sources, and importance, Need for energy management, Energy consumption patterns and conservation, Energy audit – types, methodologies, and objectives, General audit procedure, Role of energy managers and auditors, Instruments used in energy audits	**6Hrs.**
UnitNo:2	**Energy Efficiency in Electrical Systems:** Electrical load management and maximum demand control, Power factor improvement – benefits and methods, Energy-efficient motors and transformers, Lighting systems – types, efficiency, and retrofitting, Harmonics and power quality, Electrical energy conservation opportunities	**6Hrs.**
UnitNo:3	**Energy Efficiency in Thermal Systems:** Basics of thermal energy use in industries, Boilers – efficiency, testing, and heat recovery, Furnaces and insulation – performance assessment, Steam systems – distribution, condensate recovery, and losses, Waste heat recovery systems, Thermal energy conservation techniques	**6Hrs.**
UnitNo:4	**Energy Performance Assessment and Measurement:** Performance assessment of pumps, fans, compressors, HVAC systems – performance evaluation, Measurement techniques and tools (flow, temperature, pressure, etc.),Case studies on equipment efficiency improvement, Instrumentation for auditing	**6Hrs.**
UnitNo:5	**Energy Management and Economics:** Financial analysis: payback period, NPV, IRR, Life cycle costing, Energy performance contracting and ESCOs, Tariff structures and demand-side management, Cost-benefit analysis in energy-saving projects, Government policies and incentives.	**6Hrs.**
UnitNo:6	**Renewable Energy and Sustainable Development:** Overview of renewable energy sources: solar, wind, biomass, etc. Integration of renewable energy in industry and buildings, Environmental impact and sustainability, Future trends in energy management, Case studies on successful energy audit implementations.	**6Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1										1			
CO2	2	3	3		1					1		1			
CO3	2	3	2	2	1					1		1			
CO4	3	2	3	2	1					1		1			
CO5	2	3	2	2								1			

Text Books:	
1	**"Energy Management" – Paul W. O'Callaghan** *Publisher:* McGraw-Hill Education Covers fundamentals of energy management, auditing procedures, and case studies
2.	**"Energy Management Handbook" – Wayne C. Turner & Steve Doty** *Publisher:* The Fairmont Press A comprehensive reference widely used in the industry and academia; covers tools, calculations, and best practices

Reference Books:	
1	**Bureau of Energy Efficiency (BEE) Study Material for Energy Managers and Auditors** *Published by:* Ministry of Power, Government of India Official guide for the BEE certification exams; freely available on the BEE website.
2	**"Energy Conservation Guidebook" – Dale R. Patrick, Stephen W. Fardo** *Publisher:* The Fairmont Press Practical approach to energy conservation techniques
3	**"Handbook on Energy Audit and Environment Management" – Y. P. Abbi and Shashank Jain** *Publisher:* TERI Press Focused on Indian industries and environment-linked audits.

25UGVSEC-EE406- MATLAB FOR ELECTRICAL ENGINEERS

Practical : 2 Hrs/Week
Credit : 1

EvaluationScheme
ISA : 50 Marks

Course Objectives: The course aims to :	
1	To know about fundamentals of MATLAB tool .
2	To provide an overview to program curve fitting & solve Linear and Nonlinear Equations.
3	To gain knowledge about MATLAB Simulink & solve Electrical engineering problems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Able to implement loops, branching, control instruction and functions in MATLAB programming	Understanding
CO2	Able to program curve fitting, numerical differentiation and integration, solution of linear equations in MATLAB and solve electrical engineering problem.	Understanding
CO3	Able to understand implementation of ODE using ode 45 and execute Solutions of nonlinear equations and DFT in MATLAB.	Understanding
CO4	Able to simulate MATLAB Simulink examples	Understanding

Course Contents		
UnitNo:1	Introduction to MATLAB Programming: Basics of MATLAB Programming, array operations in MATLAB, loops and execution of control, working with files: Scripts and functions, plotting and programming output, examples.	
UnitNo:2	Numerical Methods and their applications: Curve Fitting: Straight line fit, Polynomial fit	
UnitNo:3	Numerical Integration and Differentiation: Trapezoidal method, Simpson method, Linear and Nonlinear Equations: Eigen values, Eigen vectors, Solution of linear algebraic equations using Gauss Elimination and LU decomposition,	
UnitNo:4	Ordinary Differential Equations: Introduction to ODE's, Euler's method, Applications to electrical engineering problems- MATLAB Simulink: Introduction to MATLAB Simulink, Simulink libraries, development of basic models in Simscape Power Systems.	

(Note: 08 experiments on above syllabus)

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1			3		2										
CO2		3	2												
CO3				2	3										
CO4			3		2										

TextBooks:	
1	Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", OXFORD Higher Education.
2	Dr. Shailendra Jain, "Modeling& Simulation using MATLAB – Simulink", Wiley – India.

Reference Books:	
1	Won Y.Tang, Wemun Cao, Tae-Sang Ching and John Morris, "Applied Numerical Methods Using MATLAB", A John Wiley & Sons.
2	Steven T. Karris, "Introduction to Simulink with Engineering Applications", Orchard Publications.

25UGAEC1-EE407- INDIAN LANGUAGE

Lectures	**:** 2 Hrs/Week	**Evaluation Scheme**	
Credit	**:** 2	**ISA**	**: 25** Marks

आधुनिक भारतीय भाषा

EE-407P-मराठी भाषेतील विशेष साहित्यकृतींचा अभ्यास

अधिव्याख्याने	**:२ तास प्रति सप्ताह**	**मूल्यमापन योजना**
श्रेयांक	**:२**	**सत्रांत परीक्षा :लागू नाही**
ट्यूटोरियल	**:लागू नाही**	**सत्र मूल्यांकन :२५गुण**

उद्दिष्टे:	
१. विद्यार्थ्यांच्यात मराठी भाषा आणि साहित्याविषयी जिज्ञासा निर्माण करणे. **२. मराठी भाषेतील प्रतिभावंत साहित्यिकांच्या कृतींचा अभ्यास करणे.** **३. मराठी साहित्याच्या वाचनाची आवड निर्माण करणे.** **४. मराठीभाषेच्या प्रचार-प्रसारासाठी विविध उपक्रम राबवणे.** **५. यांत्रिक अभियांत्रिकीतील संकल्पना मराठीभाषेतून विशद करणे.**	
विधेये:	
अभ्यासक्रम यशस्वीरीत्या पूर्ण केल्यावर विद्यार्थी खालील विधेये साध्य करेल	
वि. १	**मराठीतील विख्यात साहित्याचा आणि साहित्यिकांचा धांडोळा घेईल.**
वि. २	**अभ्यासक्रमाव्यतिरिक्त इतर साहित्यिकांच्या साहित्याचा आस्वाद घेईल.**
वि. ३	**विद्यार्थ्यांच्यात अवांतर वाचनाची गोडी लागेल.**
वि. ४	**सभाधीटपणा,नाट्य, संभाषण, वक्तृत्व अश्या विविध कला अवगत होतील.**
वि. ५	**यांत्रिक अभियांत्रिकीतील संकल्पना अधिक स्पष्ट होतील.**
विवरण:	

"मराठीभाषेतील विशेष साहित्यकृतींचा अभ्यास " या विषयाचा ***क्षमतावृद्धिंगतअभ्यासक्रमांतर्गत*** समावेश करणेत आलेला आहे. यांत्रिक अभियांत्रिकीतील संकल्पना मातृभाषेतून स्पष्टकेल्यास, विद्यार्थ्यांना त्या संकल्पना प्रभावीरीत्या समजण्यास मदत होते. अभियांत्रिकीच्या इंग्रजीतील शिक्षणामुळे विद्यार्थी आपल्या मातृभाषेपासून आणि पर्यायाने त्यातील साहित्यापासून दूर जाऊ शकतो. हा दुरावा कमी करणे, हा या विषयाचा मूळ उद्देश आहे. या विषयांतर्गत, **मराठीभाषा :उत्पत्ती आणि विकास, विशेष साहित्यकृतींचा अभ्यास – गद्य, विशेष साहित्यकृतींचा अभ्यास – पद्य, मराठीरंगभूमी – एक सांस्कृतिक वारसा आणि उपक्रम** असे एकूण पाच घटक समाविष्ट करण्यात आलेले आहेत.

संदर्भग्रंथसूची

१	**अमृतसिद्धी: १व२**,मंगलागोडबोलेवस. ह. देशपांडे, मौजप्रकाशनगृह
२	**व्यक्तीआणिवल्ली**, पु. ल. देशपांडेमौजप्रकाशनगृह
३	**मीकसाझालो?,**प्र. के. अत्रे, परचुरेप्रकाशन
४	**स्वामी**, रणजीतदेसाई, मेहतापब्लिशिंगहाउस
५	**झाडाझडती**, विश्वासपाटील, राजहंसप्रकाशन
६	**बहिणाबाईंचीगाणी**, बहिणाबाईचौधरी, सुचित्राप्रकाशन
७	**बोलगाणी**, मंगेशपाडगांवकर, मौजप्रकाशनगृह
८	**बोरकरांचीसमग्रकविता**, **खंड१व२**, बा. भ. बोरकर, देशमुखआणिकंपनी
९	**मृद्गंध**, इंदिरासंत,मेहतापब्लिशिंगहाउस
१०	**रंगमाझावेगळा**, सुरेशभट, मौजप्रकाशनगृह,

25UGEEC2-EE408- EFFECTIVE TECHNICAL COMMUNICATION

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	To help students learn technical communication along with necessary moral and ethical dimensions of engineering.
2	To enhance the ability to write clear, concise, and well-structured technical documents**,** including reports, proposals, manuals, and scientific papers.
3	To improve oral communication skills for professional presentations, group discussions, interviews, and technical seminars.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	**Demonstrate** technical communication & writing	Understand
CO2	**Make use of** Ethics in Engineering	Applying
CO3	**Make use of** Etiquettes	Applying
CO4	**Build** Self-development and Assessment	Applying

Description:		
Electrical engineers are expected to work during most of their career at middle level. They are also expected to deal with workforce and management problems. In the present era of competition, effective communication is required.		
Prerequisites:	1	Knowledge of English Communication and Discipline Courses

Course Contents		
Unit No:1	**Dynamics of Communication:** Definition and process, Kinesics, Proxemics, Paralinguistic features, Importance of Interpersonal and Intercultural Communication in today's organizations	**6 Hrs.**
Unit No:2	**Technical Writing:** Report writing, Technical proposal, Technical description, Business letters (sales, order, complaint, adjustment, inquiry, recommendation, appreciation, apology, acknowledgement, cover letter), Agenda of meeting, Minutes of meeting, Resume writing	**6 Hrs.**
Unit No:3	**Technical Communication:** Public speaking, Group discussion, Presentation strategies, Interview skills Negotiation skills, Critical and Creative thinking in communication	**6 Hrs.**
Unit No:4	**Ethics in Engineering:** Scope of engineering ethics, Accepting and sharing responsibility, Responsible professionals and ethical corporations, Resolving ethical dilemmas, Making moral choices	**6 Hrs.**
Unit No:5	**Etiquettes:** Telephone etiquettes, Etiquettes for foreign business trips, visits of foreign counterparts, Etiquettes for small talks, respecting privacy, Learning to say NO, Time management	**6 Hrs.**
Unit No:6	**Self-development and Assessment:** Change, Grow, Persist, Prioritize, Read, Learn, Listen, Record, Remember, Asses, Think, Communicate, Relate, Dream.	**6 Hrs..**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1						3		2				2			
CO2						3		2				2			
CO3						3		2				2			
CO4						3		2				2			

Text Books:	
1	” Technical Communications”, by Raman and Sharma,

Reference Books:	
1	“Communication Skills”, by Lata and Kumar,
2	“Ethics in Engineering”, by Mike Martin and Roland Schinzinger,
3	“Case Studies in Business Ethics and Corporate Governance”, by Mohapatra and Sreejesh S

Course Material: **https://sites.google.com/view/ait-etc/Home/material**

25UGVSEC2-EE409- UNIVERSAL HUMAN VALUES

Practical	**:** 2 Hrs/Week	**Evaluation Scheme**	
Credit	**:** 1	**ISA :**	50 Marks

Course Objectives: The course aims to :	
1	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	Understanding
CO2	They would have better critical ability.	Understanding
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	Understanding
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	Understanding

Description:

This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

Course Contents		
UnitNo:1	Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**4 Hrs.**
UnitNo:2	Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**4 Hrs.**
UnitNo:3	Harmony in the Family and Society : Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	**4 Hrs.**
UnitNo:4	Harmony in the Nature/Existence : Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	**4 Hrs.**
UnitNo:5	Implications of the Holistic Understanding – a Look at Professional Ethics : Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**4 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1						3		2				2			
CO2						3		2				2			
CO3						3		2				2			
CO4						3		2				2			

TextBooks:	
1	The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1
2	The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana,

Reference Books:	
1	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
2	A N Tripathy, 2003, Human Values, New Age International Publishers.

25UGAC-EE410A–ENVIRONMENTAL STUDIES

Lectures : -- **Evaluation Scheme**
Credit : -- **ISE : --**

Course Objectives: The course aims to :	
1	To understand environmental concepts
2	To understand the pollution causes and environment protection methodologies
3	To understand biodiversity and social issues of environment

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Relate the interdependency of environmental components	Analyzing
CO2	Identify the environmental problems and prevent environmental pollution	Understanding
CO3	Interpret impacts of waste on environmental components.	Applying
CO4	Analyze environmental change and its social impacts	Analyzing

Description:

The syllabus of Environmental Studies provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, shall help the students to bring a systems approach to the analysis of environmental problems.

Course Contents		
Unit No:1	**Ecology:** Ecosystem, Ecological Pyramids, Food chain, food web, Ecological succession, Natural Resources and Associated Problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources Role of individuals in conservation of natural resources.	**4 Hrs.**
Unit No:2	**Pollution:** Water pollution: causes, effects, control, drinking water quality standards, Arsenic, lead, cadmium, chromium, fluoride contamination & its effects, water treatment, wastewater treatment Air pollution: Causes, effects, control, Air pollution controlling equipments, Air quality standards, National air quality index, vehicular emission, alternative fuels, indoor air pollution, Thermal inversions, Photochemical Smog and Acid Precipitation Noise pollution: Causes, effects, control, noise standards recommended by CPCB, Environmental Protection Act , Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act and International and National efforts for Environmental Protection	**10 Hrs.**
Unit No:3	**Waste management:** Solid waste management, biomedical waste management, E waste, plastic waste management, Hazardous waste management, carbon footprint, Recycling of waste, Role of Central Pollution Control Board (CPCB),State Pollution Control Board, Role of NGO‘s.	**6 Hrs.**
Unit No:4	**Social Issues and Environment:** Global Warming, Ozone layer depletion, urban problems related to energy, Alternative energy sources, Evolution of Sustainable development: timeline, Evolution of green movements in India, Disaster management: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc., Swachh Bharat Mission, Role of Information technology in Environment and human health.	**6 Hrs.**

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	2		1											
CO3	3	2	1												
CO4	2	1													

Text Books:	
1	“Environmental Biology”, K.C.Agarwal, Nidi publication ltd,Bikaner
2.	“A Textbook of Environmental Studies”, D.K.Asthana,Meera Asthana,s.chand publication revised edition,2006
3.	“Basic course in environmental Studies”, S,Deswal & A. Deswal, Dhanpat Rai & Co Ltd,Delhi, second revised edition,2009

Reference Books:	
1	"Environmental Science- a study of inter relationship", Eldon D Enger, Bradley F. Smith W. C Brown publishers, 1989
2	"Ecology of Natural resources", Francois Ramade, John Wiley & Sons., 2009
3	"Ecology and Field Biology", Robert Leo Smith, Harper Collins publishers, 1998
4.	"Introduction to Environmental Engineering & Science", Gilbert M. Masters, Prentice Hall International Inc. Second Edition

Project Work:

Visit to Load Polluted site- Urban/Rural/Industrial/Agricultural
OR
Study of simple Ecosystems-Ponds, River, Hill slopes
OR
Preparation of small models or device to resolve the environmental problem/issue
Project work shall be based on program.

Evaluation Guideline:

- The course is non-credit Audit course and at the end of semester, course exam will be conducts as per the guidelines received from Institute. Exam will be of 60 marks for Theory paper and 40 marks for project report and same is to be converted in audit points by the program.
- Each group of Project should consist of maximum 4-5 students
- Project work shall be based on program
- The project will be evaluated by respective branch HOD and project guide and senior faculty.
- There should be a presentation of project before the committee and a hard copy is to be submitted

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