G. PULLA REDDY ENGINEERING COLLEGE (Autonomous): KURNOOL

Accredited by NBA of AICTE & NAAC of UGC

Affiliated to Jawaharlal Nehru Technological University Anantapur, Ananthapuramu

Department of Electrical & Electronics Engineering

Four Year B.Tech. Degree Course

Scheme of Instruction and Examination

III Semester **Scheme-2023**

S.No.	Category	Course Code	Title	L	T	P	C	CIA	End Exam Marks	Total Marks
1	BS	BS205	Complex Variables & Numerical Methods	3	0	0	3	30	70	100
2	HSMC	HSM201	Universal Human Values	2	1	0	3	30	70	100
3	ES	EE201	Electromagnetic Field Theory	3	0	0	3	30	70	100
4	PC	EE202	Electrical Circuit Analysis-II	3	0	0	3	30	70	100
5	PC	EE204	DC Machines & Transformers	3	0	0	3	30	70	100
6	PC	EE203	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5	30	70	100
7	PC	EE205	DC Machines & Transformers Lab	0	0	3	1.5	30	70	100
8	SC	SCCS05	Data Structures	0	1	2	2	30	70	100
9	ES	ESCM01	Design Thinking & Innovation	1	0	2	2	30	70	100
			Total	**15**	**2**	**10**	**22**			

IV Semester **Scheme-2023**

S.No.	Category	Course Code	Title	L	T	P	C	CIA	End Exam Marks	Total Marks
1	HSMC	HSM202	Managerial Economics & Financial Analysis	2	0	0	2	30	70	100
2	ES	EC212	Analog Circuits	3	0	0	3	30	70	100
3	PC	EE206	Power Systems-I	3	0	0	3	30	70	100
4	PC	EE207	Induction and Synchronous Machines	3	0	0	3	30	70	100
5	PC	EE209	Control Systems	3	0	0	3	30	70	100
6	PC	EE208	Induction and Synchronous Machines Lab	0	0	3	1.5	30	70	100
7	PC	EE210	Control Systems Lab	0	0	3	1.5	30	70	100
8	SC	SCCM01	Soft Skills	0	1	2	2	30	70	100
9	AC	AC201	Environmental Science	2	0	0	-	-	-	-
			Total	**16**	**1**	**8**	**19**			
Mandatory Community Service Project of 08 weeks duration during summer vacation										

COMPLEX VARIABLES & NUMERICAL METHODS (CVNM)

III Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
BS205	BS	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1:	Identify the analytic functions by Cauchy-Riemann equations
CO2:	Evaluate complex integrals and expand the power series of complex functions
CO3:	Apply numerical methods and principles of least square methods
CO4:	Compute interpolating polynomial and numerical differentiation for the given data.
CO5:	Solve ordinary differential equations by numerical methods

UNIT – I	
Complex Variable– Differentiation	Introduction to functions of complex variable-concept of Limit & continuity-Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method
UNIT - II	
Complex Variable– Integration	Line integral-Contour integration, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine
UNIT – III	
Solution of Algebraic & Transcendental Equations and Curve fitting	Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares
UNIT - IV	
Interpolation	Finite differences- Operators, relation between the operators, Newton's forward and backward interpolation formulae, Gauss forward and backward interpolation formulae – Lagrange's and Inverse Lagrange's interpolation formulae. Numerical Differentiation
UNIT - V	
Solution of Initial value problems to Ordinary differential equations	Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order)

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition.
2. SS Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. B.V.Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers.
3. R.K. Jainand S. R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2021 5th Edition (9th reprint).

Web References:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
3. http://nptel.ac.in/courses/111105090

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

UNIVERSAL HUMAN VALUES

III Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
HSM201	HSMC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		2	1	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1:	Define the terms like Natural Acceptance, Happiness and Prosperity.
CO2:	Identify one's self, and one's surroundings(family, society, nature)
CO3:	Apply what they have learnt to their own self in different day-to-day settings in real life.
CO4:	Relate human values with human relationship and human society.
CO5:	Justify the need for universal human values and harmonious existence
CO6:	Develop as socially and eco logically responsible engineers

UNIT – I

Introduction to Value Education	Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Lecture2: Understanding Value Education Tutorial 1: Practice Session PS1 Sharing about Oneself Lecture3: self-exploration as the Process for Value Education Lecture4: Continuous Happiness and Prosperity–the Basic Human Aspirations Tutorial2: Practice Session PS2 Exploring Human Consciousness Lecture 5: Happiness and Prosperity – Current Scenario Lecture 6: Method to Fulfil the Basic Human Aspirations Tutorial3: Practice Session PS3 Exploring Natural Acceptance

UNIT - II

Harmony in the Human Being	Lecture 7: Understanding Human being as the Co-existence of the self and the body. Lecture8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. Lecture9: The body as an Instrument of the self Lecture 10: Understanding Harmony in the self Tutorial5: Practice Session PS5 Exploring Sources of Imagination in the self Lecture 11: Harmony of the self with the body Lecture12: Programme to ensure self-regulation and Health Tutorial6: Practice Session PS6 Exploring Harmony of self with the body

UNIT – III

Harmony in the Family and Society	Lecture13: Harmony in the Family–the Basic Unit of Human Interaction Lecture 14: 'Trust' – the Foundational Value in Relationship Tutorial7: Practice Session PS7 Exploring the Feeling of Trust Lecture 15: 'Respect' – as the Right Evaluation Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect Lecture16: Other Feelings, Justice in Human-to-Human Relationship Lecture 17: Understanding Harmony in the Society Lecture18: Vision for the Universal Human Order Tutorial9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT - IV

Harmony in the Nature/Existence	Lecture19: Understanding Harmony in the Nature Lecture20: Inter connectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature Tutorial10: Practice Session PS10 Exploring the Four Orders of Nature Lecture 21: Realizing Existence as Co-existence at All Levels Lecture22: The Holistic Perception of Harmony in Existence Tutorial11: Practice Session PS11 Exploring Co-existence in Existence
UNIT - V	
Implications of the Holistic Understanding – a Look at Professional Ethics	Lecture 23: Natural Acceptance of Human Values Lecture24: Definitiveness of (Ethical) Human Conduct Tutorial12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture26: Competence in Professional Ethics Tutorial13: Practice Session PS13 Exploring Humanistic Models in Education Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies Lecture28: Strategies for Transition towards Value-based Life and Profession Tutorial14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Text Books

1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.
2. R R Gaur, R Asthana, G P Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.

Reference Books

1. Jeevan Vidya: Ek Parichaya, ANagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N.Tripathi, New Age Intl. Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth-by Mohandas Karamchand Gandhi

Web References:

1. 1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. 2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. 3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. 4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. 5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTROMAGNETIC FIELD THEORY (EMF)

III Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE201	ES	3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Apply three dimensional orthogonal coordinate systems and vector calculus to solve problems related to field theory

CO2: Apply basic laws of electrostatics for various electric field related problems /applications

CO3: Apply principles of electrostatics to differentiate the behavior of electric field in free space, material space and obtain parameters related to electrical field

CO4: Apply basic laws of magnetostatics and obtain parameters related to magnetic field

CO5: Apply Maxwell's equations for time varying fields

UNIT – I	
Vector Algebra	Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.
Coordinate Systems	Rectangular, Cylindrical and Spherical coordinate systems.
Vector Calculus	Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar.
UNIT - II	
Electrostatics	Definition of field, Coulomb's Law, Electric Field Intensity (EFI) – EFI due to point, line and surface charge distribution , Electric Flux Density - Gauss's law, Application of Gauss's Law, divergence theorem (statement only), Maxwell's first equation $(\nabla.\bar{D}) = \rho_v$, Work done in moving a point charge in an electrostatic field, Electric Potential – Potential due to point, line and surface charge distributions, gradient of potential, Poisson's and Laplace's equations, conservative field, Maxwell's second equation$(\nabla X\bar{E} = 0)$, energy stored and energy density in a static electric field, Numerical problems.
UNIT – III	
Electric fields in Material space	Classification of materials, Current density-conduction and convection current densities, Behaviour of conductors and dielectrics in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space.
Capacitor and Capacitance	Capacitance – Calculation of capacitance due to parallel plate, cylindrical and spherical capacitors using Laplace's equations, Multiple dielectric capacitors, and energy stored in a capacitor, Numerical problems.
UNIT - IV	
Magnetostatics	Biot - Savart's law, Magnetic field intensity (MFI) – MFI due to a straight current carrying filament, Magnetic flux density, Ampere's circuit law - Ampere's circuit law applications, MFI due to a straight current carrying filament, circular, solenoid current carrying wire, Maxwell's third equation

	$(\nabla X \bar{H}) = \bar{J}$, Maxwell's fourth equation $(\nabla . \bar{B} = 0)$.
Magnetic Force and Inductance	Magnetic force on a moving charge in a magnetic field, Force on a current element in a magnetic field, Force between two straight long and parallel current carrying conductors, Lorentz force equation, Self and mutual inductance; Determination of self inductance of a solenoid and toroid, Analogy between electric and magnetic circuits.
UNIT - V	
Time Varying Fields	Faraday's laws of electromagnetic induction, Static and dynamic induced emf's, Displacement current, Maxwell's equations for time varying fields - Comparison of Maxwell's equations for time invariant and time varying fields (integral and point form).

Text Books

1. Matthew N O Sadiku, "Principles of Electromagnetics", Oxford University Press, 4th Edition.
2. William H. Hayt & John. A. Buck, "Engineering Electromagnetics", Mc. GrawHill Companies, 7th Edition, 2006.

Reference Books

1. Joseph Edminister, "Electromagnetics", 2nd Edition, Schaum's outline series TMH, 2004.
2. S.Sivanagaraju , C.Srinivasa Rao, "Electromagnetic Fields", New Age publishers, India,2008.

Web References:

1. https://nptel.ac.in/courses/108/106/108106073/
2. https://www.youtube.com/watch?v=ZRvXEAzfP0A&list=PLVd_4SAWgKyqwxjVXzlX0ZzFMNZpCiyfB&index=1
3. https://www.youtube.com/watch?v=wcFKhanj5ag

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ELECTRICAL CIRCUIT ANALYSIS-II (ECA-II)

III Semester: EEE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE202	PC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Analyse three phase balanced and unbalanced circuits

CO2: Apply Differential equations and Laplace transform techniques to RLC circuits

CO3: Determine the network parameters of two port networks

CO4: Determine the Fourier series of periodic waveform and performance parameters of non-sinusoidal waveforms

CO5: Classify filters and design constant -K low pass and high pass filters.

UNIT – I	
Analysis of three phase balanced circuits	Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power
Analysis of three phase unbalanced circuits	Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power
UNIT - II	
Laplace transforms	Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals, Inverse Laplace transforms and applications
Transient Analysis	Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach
UNIT – III	
Network Parameters	Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations- problems
UNIT - IV	
Analysis of Electric Circuits with Periodic Excitation	Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics
UNIT - V	
Filters	Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters

Text Books

1. EngineeringCircuitAnalysis,WilliamHaytandJackE.Kemmerly,8thEdition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rdEdition, Tata

McGraw-Hill, 2019

Reference Books

1. Network Analysis, M.E.Van Valkenburg, 3rd Edition, PHI, 2019
2. Network Theory, N.C.Jaganand C. Lakshminarayana, 1st Edition, B.S.Publications, 2012
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017
4. Electrical Circuit Analysis, Sivanaga Raju, G. Kishor and C. Srinivasa Rao, 1st Edition, Cengage Learning India Publishers, Delhi
5. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)-Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha,Umesh Publications 2012
6. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai& Co., 2018, 7th Revised Edition

Web References:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

Question Paper Pattern

Sessional Exam:

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End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

DC MACHINES & TRANSFORMERS (DCMT)

<table>
<tr><td colspan="5">III Semester: EEE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">EE204</td><td rowspan="2">PC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Analyse the constructional aspects, process of armature reaction and commutation in DC machines</td></tr>
<tr><td colspan="9">CO2: Analyse the performance characteristics and parallel operation of DC generators</td></tr>
<tr><td colspan="9">CO3: Apply the starting, speed control methods and testing of DC motors</td></tr>
<tr><td colspan="9">CO4: Analyse the constructional aspects, performance characteristics and testing of transformers</td></tr>
<tr><td colspan="9">CO5: Compare autotransformers with two winding transformers and various three-phase transformer configurations</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="2">DC Machines</td><td colspan="7">Constructional details, Principle of operation of a DC generator, armature windings - simplex lap and wave windings, EMF equation, armature reaction and its effects – cross magnetizing and demagnetizing AT/pole, methods of improving armature reaction and commutation- numerical problems</td></tr>
<tr><td colspan="9">UNIT - II</td></tr>
<tr><td colspan="2">Performance of DC Generators</td><td colspan="7">Methods of excitation – separately excited and self-excited generators, build up of EMF and causes for failure, open circuit characteristics – critical field resistance and critical speed. Load characteristics of separately excited and self-excited generators – Parallel operation of DC generators - Applications of DC generators- numerical problems</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="2">DC Motors</td><td colspan="7">Principle of operation of a DC motor – Back-emf - Generation of torque - Torque equation - Performance characteristics of different types of motors – Necessity of starters- 3-point and 4-point starters - Losses and efficiency in DC machines- Applications of DC Motors- numerical problems</td></tr>
<tr><td colspan="2">Speed Control and Testing of DC Machines</td><td colspan="7">Speed control of DC motors: Armature control and Flux control methods, Testing of DC machines: Brake test - Swinburne’s test - Hopkinson's test – Field’s test and Separation of stray losses test- numerical problems</td></tr>
<tr><td colspan="9">UNIT - IV</td></tr>
<tr><td colspan="2">Single-phase Transformers</td><td colspan="7">Construction details, principle of operation on no-load and on load, EMF equation equivalent circuit, phasor diagrams–lagging, leading and unity power factors loads, Losses and efficiency, Per unit system, Regulation, All-day efficiency, Effect of variations of frequency & supply voltage on iron losses, applications- numerical problems</td></tr>
<tr><td colspan="2">Testing of Transformers</td><td colspan="7">Open circuit and short circuit tests, Sumpner’s test, separation of losses test- parallel operation of transformers- numerical problems</td></tr>
<tr><td colspan="9">UNIT - V</td></tr>
<tr><td colspan="2">Autotransformers</td><td colspan="7">Autotransformers-equivalent circuit- comparison with two-winding transformers- numerical problems</td></tr>
<tr><td colspan="2">Poly-phase Transformers</td><td colspan="7">Poly-phase transformer connections -Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and three winding transformers, tertiary windings, tap changing transformers, Scott</td></tr>
</table>

	connection- numerical problems
Text Books	
1. Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi,1995	
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002	
Reference Books	
1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 5th edition	
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2011	
3. Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers, 2021	
4. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007	
5. Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,&Umans, S. D, 7th edition, McGraw-Hill Education, 2014	
Web References:	
1. nptel.ac.in/courses/108/105/108105112	
2. nptel.ac.in/courses/108/105/108105155	
Question Paper Pattern	
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions. **End Examination:** The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.	

ELECTRICAL CIRCUIT ANALYSIS –II AND SIMULATION LAB (ECAS(P))

III Semester : EEE							Scheme : 2023
Course Code	Hours/Week			Credits	Maximum Marks		
EE203	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	1.5	30	70	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Estimate the real and reactive powers in three phase circuits

CO2: Determine two port network parameters

CO3: Analyze electrical circuits using software tools

List of Experiments

Note : At least 10 of the following experiments shall be conducted

1. Measurement of Active Power and Reactive Power for balanced loads
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters.
5. Verification of Kirchhoff's current law and voltage law using simulation tools
6. Verification of mesh and nodal analysis using simulation tools
7. Verification of superposition and maximum power transfer theorems using simulation tools
8. Verification of Reciprocity and Compensation theorems using simulation tools
9. Verification of Thevenin's and Norton's theorems using simulation tools
10. Verification of series and parallel resonance using simulation tools
11. Simulation and analysis of transient response of RL, RC and RLC circuits
12. Verification of self-inductance and mutual inductance by using simulation tools

DC MACHINES & TRANSFORMERS LAB (DCMT(P))

III Semester : EEE							Scheme : 2023
Course Code	Hours/Week			Credits	Maximum Marks		
EE205	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	1.5	30	70	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Analyse the starting and speed control methods of DC Machines

CO2: Analyse the performance characteristics of DC Machines

CO3: Analyze the parallel operation of single phase transformers

CO4: Determine the performance parameters of single-phase transformer

CO5: Analyze the performance of Scott connected transformers

List of Experiments

Note : At least 10 of the following experiments shall be conducted

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control
2. Brake test on DC shunt motor- Determination of performance curves
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor
4. Hopkinson's test on DC shunt Machines
5. Load test on DC compound generator-Determination of characteristics
6. Load test on DC shunt generator-Determination of characteristics
7. Fields test on DC series machines-Determination of efficiency
8. Brake test on DC compound motor-Determination of performance curves
9. OC & SC tests on single phase transformer
10. Sumpner's test on single phase transformer
11. Scott connection of transformers
12. Parallel operation of Single-phase Transformers
13. Separation of core losses of a single-phase transformer

DATA STRUCTURES (DS(P))

III Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
SCCS05	SC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	1	2	2	30	70	100
							End Exam Duration: 3 Hrs	

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the role of data structures in organizing and accessing data

CO2: Design, implement and apply linked lists for dynamic data storage

CO3: Develop applications using stacks and queues

CO4: Design and implement algorithms for operations on binary trees and binary search trees

CO5: Design novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees

UNIT – I

Introduction to Data Structures	Definition and importance of Data structures, Abstract data types (ADTs) and its specifications
Arrays	Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays
Searching Techniques	Linear & Binary Search,
Sorting Techniques:	Bubble sort, Selection sort, Quick sort
Sample experiments	1. Program to find min & max element in an array. 2. Program to implement matrix multiplication. 3. Find an element in given list of sorted elements in an array using Binary search. 4. Implement Selection and Quick sort techniques

UNIT - II

Linked Lists	Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists
Sample experiments	1. Write a program to implement the following operations. a. Insert b. Deletion c. Traversal 2. Write a program to store name, roll no, and marks of students in a class using circular double linked list. 3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT – III

Stacks	Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.
Sample experiments	1. Implement stack operations using a. Arrays b. Linked list 2. Convert given in fix expression in to post fix expression using stacks. 3. Evaluate given post fix expression using stack. 4. Write a program to reverse given linked list using stack.

UNIT - IV

Queues	Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.
Deques	Introduction to deques (double-endedqueues), Operations on deques and their applications.
Sample experiments	1. Implement Queue operations using a. Arrays b. Linked list 2. Implement Circular Queue using a. Arrays b. Linked list 3. Implement Dequeue using linked list.
UNIT - V	
Trees	Introduction to Trees, Binary trees and traversals, Binary Search Tree–Insertion, Deletion & Traversal
Sample experiments	1. Implement binary tree traversals using linked list. 2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.
Text Books	
1. Data Structures and algorithm analysis in C,Mark AllenWeiss,Pearson,2ndEdition	
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008	
Reference Books	
1. AlgorithmsandDataStructures:TheBasicToolboxbyKurtMehlhornandPeter Sanders	
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft	
3. Problem Solving with Algorithms and Data Structures by Brad Millerand David Ranum	
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein	
5. AlgorithmsinC,Parts1-5(Bundle):Fundamentals,DataStructures,Sorting, Searching, and Graph Algorithms" by Robert Sedgewick	

DESIGN THINKING & INNOVATION (DTI)

III Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ESCM01	ES	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		1	0	2	2	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Define the concepts related to Design thinking

CO2: Explain the fundamentals of Design Thinking and innovation

CO3: Apply the design thinking techniques for solving problems in various sectors

CO4: Analyse to work in a multidisciplinary environment

CO5: Formulate specific problem statements of real time issues

UNIT – I	
Introduction to Design Thinking	Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry
UNIT - II	
Design Thinking Process	Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development
Activity	Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development
UNIT – III	
Innovation	Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity
Activity	Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation
UNIT - IV	
Product Design	Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies
Activity	Importance of modelling, how to set specifications, Explaining their own product design
UNIT - V	
Design Thinking in Business Processes	Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes
Activity	How to market our own product, About maintenance, Reliability and plan for startup

Text Books
1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons
Reference Books
1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, Jill Butter
4. Chesbrough.H, The Era of Open Innovation – 2013
Web References:
1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (MEFA)

IV Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
HSM202	HSMC	3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Adopt the concepts of Managerial Economic for decision making and forward planning in business organizations

CO2: Apply the Concepts of Production, cost and revenues for effective Business decision

CO3: Evaluate different types of business organizations and provide a framework for different Market Structures and the price determination

CO4: Understand the significance of capital, types of capital and sources of capital and evaluate the capital budgeting techniques for choosing the optimal projects

CO5: Adopt the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts and implement various techniques for assessing the financial position of the business

UNIT – I	
Managerial Economics and Demand Analysis	Introduction – Meaning, Nature& Scope and Uses of Managerial Economics, Role of Managerial Economist. Demand-Concepts, Law of Demand, Exceptions of Law of Demand, Law of Diminishing Marginal Utility, Indifference Curve Elasticity of Demand – Types and Measurement and Significance
UNIT - II	
Production and Cost Analysis	Introduction –Production Function –Meaning, Features and types. Short run and long run Production Function, Isoquants and Isocosts, Least- cost combination– Cost = Cost concepts and Cost behaviour in Short-run and Long-run Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).
UNIT – III	
Business Organizations and Markets	Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies. Types of Markets - Perfect and Imperfect Markets; Features of Perfect Competition, Monopoly, Monopolistic and Oligopoly; Price-Output Determination under Perfect and Monopoly
UNIT - IV	
Capital and its Significance and Capital Budgeting	Capital and its Significance: Types of Capital, Estimation of fixed and working capital requirements, Methods and sources of raising fixed and working capital. Capital Budgeting: Meaning, Significance and Complications involved in Capital Budgeting decisions, Methods of Capital Budgeting - Traditional Methods- Payback period and Accounting rate of return methods, Discounted Cash flow methods- Net present value method, Internal Rate of return method and Profitability index method (Simple Problems)
UNIT - V	
Financial	Introduction – Concepts and Conventions- Double-Entry System of Bookkeeping,

Accounting and Analysis	Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation ofLiquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability Ratios

Text Books

1. Varshney & Maheswari: Managerial Economics, Sultan Chand
2. A.R. Aryasri:Managerial Economics and Financial Analysis, 4/e, MGH

Reference Books

1. Ahuja Hl Managerial economics Schand
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

ANALOG CIRCUITS (AC)

IV Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EC212	ES	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Apply the concepts of Diode clippers and clampers which helps in designing signal generators, different amplifier configurations with biasing arrangements

CO2: Analyze transistor amplifiers and feedback amplifiers at low frequencies which helps in designing low noise and more stable amplifiers

CO3: Design frequency selective Oscillators and Operational Amplifiers

CO4: Analyze the applications of Op-Amps which help in designing various comparators and waveform generators

CO5: Evaluate various circuit characteristics by using timers, Phase locked loops, operational amplifiers and signal converters

UNIT – I	
Diode clipping and clamping circuits	Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation
DC biasing of BJTs	Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in VBE and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability
UNIT - II	
Small Signals Modeling of BJT	Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC amplifiers
Feedback Amplifiers	Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback
UNIT – III	
Oscillator Circuits	Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.
Operational Amplifiers	Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features
UNIT - IV	
OP-AMPS Applications	Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator
Comparators and Waveform Generators	Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators
UNIT - V	
Timers and Phase	Introduction to 555 timer, functional diagram, Monostable and Astable operations

Locked Loop	and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566)
Digital To Analog And Analog To Digital Converters	Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications

Text Books

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003

Reference Books

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017
3. Electronic Devices and Circuits – David Bell, Oxford, 5th Edition, 2008
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007
5. Operational Amplifiers and Linear Integrated Circuits – Gayakwad R.A, Prentice Hall India, 2002
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010
7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

Web References:

1. https://nptel.ac.in/courses/122106025
2. https://nptel.ac.in/courses/108102112

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

POWER SYSTEMS-I (PS-I)

IV Semester: EEE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE206	PC	3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand various conventional power generation methods

CO2: Understand various non-conventional power generation methods

CO3: Analyse the constructional aspects and bus bar systems in various substations

CO4: Understand the concepts of distribution systems and UG cables

CO5: Analyze various economic aspects related to power generation and consumption

UNIT – I	
Conventional Power Generation	**Hydro Power Generation**- Description and layout of a hydro power plant, major components and principle of operation and types of hydro station. **Thermal Power Generation**- Description and layout of a thermal power plant, components- boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, cooling towers and chimney. **Nuclear Power Generation**- Working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components- moderators, control rods, reflectors and coolants.
UNIT - II	
Non-Conventional Power Generation	**Solar Energy:** Solar radiation, Principle of solar photo voltaic conversion, solar cells, solar PV power generation, solar PV applications. **Wind Energy:** Wind energy conversion principles, components of wind energy conversion systems (WECS). **Fuel Cell & Hydrogen Energy:** Introduction and principle of energy conversion
UNIT – III	
Substations	**Air Insulated Substations** – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams. **Gas Insulated Substations (GIS)** – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.
UNIT - IV	
Distribution Systems	Classification of Distribution systems, A.C Distribution, Overhead versus Underground system, Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system - numerical problems
Underground Cables	Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and

	intersheath grading- numerical problems
UNIT - V	
Economic Aspects & Tariff	**Economic Aspects** – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants- numerical problems **Tariff Methods**– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods, Time of Day (ToD) tariff and Time of Use (ToU) tariff - numerical problems

Text Books

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J. B. Gupta, Transmission and Distribution of Electrical Power, S. K. Kataria and sons,10th Edition, 2012
3. R. K. Rajput, Non Conventional Energy Sources and Utilization, S Chand Publications, 2nd Edition, 2014.

Reference Books

1. I. J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019
2. C. L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985
5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007

Web References:

1. https://nptel.ac.in/courses/108102047

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

INDUCTION AND SYNCHRONOUS MACHINES (ISM)

IV Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE207	PC	3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Analyse the constructional aspects of 3-phase rotating machines and performance characteristics of three phase induction motors

CO2: Apply testing, starting and speed control methods for three phase induction machines

CO3: Analyze the constructional aspects, armature reaction, voltage regulation and parallel operation of alternators

CO4: Analyse the performance characteristics of synchronous motors

CO5: Compare various fractional kilowatt motors

UNIT – I	
3-phase induction motors	Constructional features, distributed, concentrated and chorded windings, integral slot and fractional slot windings, principle of working of 3-phase induction motor, EMF equation, distribution, pitch and windings factors, Phasor diagram, equivalent circuit, rotor emf and rotor frequency, rotor power input, rotor copper loss and mechanical power developed and their inter-relationship, torque equation, expressions for maximum torque and starting torque, torque - slip characteristics, crawling and cogging -numerical problems.
UNIT - II	
Performance of 3-Phase induction motors	No load and rotor blocked tests, circle diagram, methods of starting –direct online starting, autotransformer starting, star-delta starting, rotor resistance starter and starting current and starting torque calculations, speed control of induction motor with stator voltage control, V/f control method, rotor resistance control and rotor emf injection technique (qualitative treatment only)– Induction generator operation (working principle only)-numerical problems.
UNIT – III	
Alternators	Construction and classification of synchronous machines, armature reaction, voltage regulation by synchronous impedance method – MMF method and Potier triangle method, two reaction analysis of salient pole machines - Slip test, synchronization of alternators, Parallel operation of alternators, effect of change of excitation and mechanical power input - numerical problems
UNIT - IV	
Synchronous Motors	Synchronous motor principle and theory of operation – Effect of excitation on current and power factor–V and inverted V curves, synchronous condenser – synchronous power and power angle characteristics –hunting and its suppression – methods of starting, Applications - numerical problems
UNIT - V	
Fractional kilowatt Machines	Working principle of single phase induction motor, Double field revolving theory, determination of equivalent circuit parameters - numerical problems, starting methods and types -split-phase induction motors, capacitor motors, capacitor start

	motors, two value capacitor motors, permanent split capacitor (PSC) motor, shaded pole induction motor. Principle of operation of reluctance motor, stepper motor, BLDC motor and universal motor

Text Books

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021, 7th Edition
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002

Reference Books

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, 5th Edition
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, 7th Edition

Web References:

1. https://nptel.ac.in/courses/108/105/108105131
2. https://nptel.ac.in/courses/108106072

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

CONTROL SYSTEMS (CS)

IV Semester: Common to EEE & ECE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE209	PC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Develop the mathematical model, transfer function of a system

CO2: Analyse the response of 1st and 2nd order control system for unit step input and understand various controllers

CO3: Apply analytical and graphical techniques to determine the stability of a control system in time domain

CO4: Apply graphical techniques to determine the stability of a control system in frequency domain and understand various compensators

CO5: Develop state model of a given control system and test its controllability and observability

UNIT – I	
Control Systems Concepts	Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational mechanical systems and electrical systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Transfer Function of AC and DC servo motor
UNIT - II	
Time Response Analysis	Time Response of first order control systems subjected to Unit Step input - Time Response of second order control systems subjected to Unit Step input. Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system
UNIT – III	
Stability Analysis in Time Domain	The concept of stability – Routh Hurwitz stability criterion – Stability and conditional stability - limitations of Routh Hurwitz stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci
UNIT - IV	
Frequency Response Analysis	Frequency domain specifications: resonant peak and resonant frequency for a second order system, Co-relation between time and frequency response, gain margin (GM) and phase margin (PM).Stability Analysis from Bode Plots - Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis.The necessity of compensation, series and parallel compensation, Realization of basic lead, Lag and lead-Lag compensators.(Without Design)
UNIT - V	
State Space Analysis of Continuous Systems	Concepts of state, state variables and state model - differential equations & Transfer function models. Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. The concepts

	of controllability and observability

Text Books

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5thedition, 2010
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition,2003
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson,2000
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson, 2010

Question Paper Pattern

Sessional Exam:

The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No. 2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall answer any one of them. Each of these questions may contain sub-questions.

End Examination:

The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No. 2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall answer any one of them. Each of these questions may contain sub-questions.

INDUCTION AND SYNCHRONOUS MACHINES LAB (ISM(P))

IV Semester : EEE						Scheme : 2023	
Course Code	Hours/Week			Credits	Maximum Marks		
	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
EE208	-	-	3	1.5	30	70	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Analyze various performance characteristics of 3-phase and 1-phase induction motors

CO2: Derive the equivalent circuit of 3-phase and 1-phase Induction Motor

CO3: Analyse the power factor improvement of 1- phase Induction Motor by using capacitors

CO4: Determine the voltage regulation of 3-phase alternator

CO5: Determine the performance characteristics synchronous machine

List of Experiments

Note : At least 10 of the following experiments shall be conducted

1. Brake test on three phase Induction Motor
2. Circle diagram of three phase induction motor
3. Speed control of three phase induction motor by V/f method
4. Equivalent circuit of single-phase induction motor
5. Power factor improvement of single-phase induction motor by using capacitors
6. Load test on single phase induction motor
7. Regulation of a three -phase alternator by synchronous impedance & MMF methods
8. Regulation of three-phase alternator by Potier triangle method
9. V and Inverted V curves of a three-phase synchronous motor
10. Determination of X_d, X_q & Regulation of a salient pole synchronous generator
11. Determination of efficiency of three phase alternator by loading with three phase induction motor
12. Parallel operation of three-phase alternator under no-load and load conditions
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test

CONTROL SYSTEMS LAB (CS(P))

IV Semester : EEE							Scheme : 2023
Course Code	Hours/Week			Credits	Maximum Marks		
EE210	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	1.5	30	70	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Examine the behavior of second order control system, servos and stepper motors

CO2: Analyze the stability of a control system in time and frequency domain using simulation tool

CO3: Determine the steady state error and peak over shoot of a second order control system using PID controller

CO4: Analyse the behaviour of control system with various compensators

CO5: Verify the truth tables using PLC

List of Experiments

Note : At least 10 of the following experiments shall be conducted

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order system
6. Lag and lead compensation – Magnitude and phase plot
7. Temperature controller using PID
8. Stepper motor Control
9. Study of DC Position Control Systems
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Linear system analysis (Time domain analysis, Error analysis) using MATLAB
13. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
14. State space model for classical transfer function using MATLAB – Verification

SOFT SKILLS (SS(P))

IV Semester: EEE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
SCCM01	SC	0	1	2	2	30	70	100
							End Exam Duration: 3 Hrs	

Course Outcomes : At the end of the course the student will be able to

CO1: Enhance teamwork and professional growth in engineering and related fields through foundational soft skills and practical communication proficiency

CO2: Develop effective presentation skills to meet industry standards, enabling clear and professional communication of ideas and information

CO3: Develop the ability to identify and employ a variety of problem-solving and decision-making methods that is relevant and effective in real-world situations

CO4: Develop and apply emotional intelligence and stress management techniques to enhance personal, professional well-being and emotional well-being

CO5: Understand and develop the corporate etiquette necessary to present themselves in a professional setting

UNIT – I	
Soft Skills & Communication Skills	**Soft Skills** - Introduction, Need - Mastering Techniques of Soft Skills – Communication. Skills -Significance, process, types - Barriers of communication - Improving techniques
Activities	**Intrapersonal Skills**- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity. (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources) – Stake holders Management **Interpersonal Skills**- Group Discussion – Debate – Team Tasks - Book and film reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic. **Verbal Communication**- Extempore- brief addresses and speeches convincing- negotiating- agreeing and disagreeing with professional grace. **Non-verbal communication** – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation
UNIT - II	
Presentation Skills	Types of presentations-Delivery techniques – Engaging the audience – Handling Q&A and feedback – Research Content – Visual aids and materials
Activities	Poster Presentation Power Point Presentation Oral Presentation
UNIT – III	
Problem Solving & Decision Making	Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles
Activities	Placing a problem which involves conflict of interests, choice and views –

	formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision
UNIT - IV	
Stress Management	Self-awareness –Self-Regulation – Stress factors – Controlling Stress – Tips
Activities	Providing opportunities for the participants to narrate certain crisis and stress – ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates
UNIT - V	
Corporate Etiquette	Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- e-mail etiquette - Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips - Overcoming challenges
Activities	Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Text Books

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018.

Reference Books

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018
2. Alex K, Soft Skills S.Chand& Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Web References:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

ENVIRONMENTAL SCIENCE (ES)

III/IV Semester : Common to all Branches						Scheme: 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
AC201	AC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		2	0	0	0			

Course Outcomes: After the completion of the course students will be able to

CO1: Apply the knowledge of environmental issues in area of work. Interpret the need for the conservation of Natural resources for sustainable development.

CO2: Pursue the importance of Ecosystem and conservation of biodiversity

CO3: Assess the problems due to environmental pollution with remedial measures and issues related to environment.

CO4: Evaluate sustainable development and address environmental issues.

CO5: Interpret the use of IT & related technology to conserve environment & human health.

UNIT – I

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems. Forest resources – Use and over-exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems. Food resources – World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer, pesticide problems, water logging, salinity, case studies. Energy resources – solar, wind and nuclear energy resources.

UNIT – II

Ecosystems: Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers. Energy flow in the ecosystem – Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and functions of the forest and aquatic (pond and ocean) ecosystems.

Biodiversity and its Conservation: Introduction, Definition: genetic, species and ecosystem diversity. Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Noise pollution
d. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution – Pollution case studies. Disaster management: floods, earthquake and cyclone.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting – Environmental ethics. Global issues and possible solutions – Climate change, global warming, acid rain and ozone layer depletion – Case Studies.

Consumerism and waste products. Environment Protection Acts – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act. Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population and the Environment: Population growth, Population explosion – Family Welfare Programmes. – Environment and human health. Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

Field Work: Visit to a local area to document environmental assets River/forest/grassland/ hill/mountain – Visit to a local polluted site – Urban/Rural/Industrial/Agricultural study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. C. P. Kaushik and Anubha Kaushik, "Environmental Studies" New Age International (P) Ltd., New Delhi.
2. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses" University Grants Commission, Universities Press.
3. Y. Anjaneyulu "Introduction to Environmental Sciences", BS Publications, Hyderabad.
4. R. Rajagopalan, "Environmental Studies", Oxford University Press, Chennai.
5. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company.

References:

1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi.
2. Decksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
3. M. Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
4. Palaniswamy, "Environmental Studies", Pearson Education.
5. J. P. Sharma, "Comprehensive Environmental Studies", Laxmi Publications.
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science", Prentice Hall of India Private limited.