

Faculty of Engineering & Technology
 KAKATIYA UNIVERSITY, WARANGAL-506 009
 Department of Electrical & Electronics Engineering

B. Tech. (EEE) III SEMESTER

Sl. No.	Category	Course code	Course title	Period/Week			Credits
				L	T	P	C
1	BSC	BSC105	Mathematics III	3	0	0	3
2	PCC	EE211	Electrical Circuits - I	3	1	0	4
3	PCC	EE212	Electrical Machines-I	3	1	0	4
4	PCC	EE213	Power Systems - I	3	1	0	4
5	PCC	EE214	Electromagnetic fields	3	1	0	4
6	PCC	EE215	Analog Electronics	3	0	0	3
7	PCC	EE216L	Analog Electronics Laboratory	0	0	2	1
8	PCC	EE217L	Computer Aided Electrical Drawing Laboratory	0	0	2	1
9	MC	MC210	Environmental Sciences	2	0	0	0
TOTAL CREDITS				20	5	4	24

[L= Lectures, T= Tutorials, P= Practical, C= Credits]

Faculty of Engineering & Technology
 KAKATIYA UNIVERSITY, WARANGAL-506 009
 Department of Electrical & Electronics Engineering

B. Tech. (EEE) III SEMESTER
BSC-105
Mathematics - III
STATISTICS, PROBABILITY, AND NUMERICAL TECHNIQUES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

Module1: Statistical Methods

Introduction, Collection of Data, Graphical Representation, Measures of Dispersion, Moments, Skewness, Kurtosis, Correlation, Coefficient of Correlation, Lines of Regression.

(Sections 25.1, 25.2, 25.3, 25.6, 25.9, 25.10, 25.11, 25.12, 25.13, 25.14 of Text Book)

Module2: Probability & Distributions

Probability, Addition Law of Probability, Independent Events, Baye’s Theorem , Random Variable, Continuous Probability Distribution, Expectation, Moment Generating Function, Binomial Distribution , Poisson Distribution, Normal Distribution, Exponential Distribution.

(Sections 26.1, 26.4, 26.5, 26.6, 26.7, 26.9, 26.10, 26.11, 26.14, 26.15, 26.16, 26.19(6) of Text Book)

Module3: Numerical Techniques-I

Solution of Algebraic and Transcendental Equations, Principle of Least Squares, Method of Least Squares, Fitting of Other Curves, Finite Differences, Forward Differences, Backward Differences. (Sections 28.2, 24.4, 24.5, 24.6, 30.2, 30.2(1), 30.2(2) Of Text Book)

Module4: Numerical Techniques-II

Central Differences, Other Difference Operators, Newton’s Interpolation Formulae, Gauss’s Forward Interpolation Formula, Interpolation with Unequal Intervals, Numerical Differentiation. Sections 29.7, 29.4, 29.6, 29.7(1), 29.9, 30.1.of Text Book)

Module5: Numerical Techniques-III

Numerical Integration, Trapezoidal Rule, Simpson’s one –third Rule, Simpson’s three-eight Rule, Weddle’s Rule, Solution of Simultaneous Linear Equations (Iterative Methods)

(Sections 30.4, 30.6, 30.7, 30.8, 30.10, 28.5 of Text Book)

Text Book:

B.S Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publications.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons
2. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Ltd.

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B. Tech. (EEE) III SEMESTER
MC-210
ENVIRONMENTAL SCIENCES

Teaching Scheme				Examination Scheme	
L	T	P	C	CIE	ESE
0	0	2	0	30 Marks	70 Marks

UNIT-I (8)

Introduction to Environmental Science: Environment and society, major environmental issues: Ozone layer depletion, Acid rains, global climate change etc, sustainable development, Environmental impact assessment, environmental management

Natural Resources Utilization and its Impacts: Energy, minerals, water and land resources, Resource consumption, population dynamics, urbanization..

UNIT-II (8)

Ecology and Biodiversity: Energy flow in ecosystem, food chain, nutrient cycles, eutrofication value of biodiversity, biodiversity at global, national and local levels, threats for biodiversity, conservation of biodiversity.

UNIT-III (8)

Water Pollution: Sources, types of pollutants and their effects, water quality issues, contaminant transport, self-purification capacity of streams and water bodies, water quality standards, principles of water and wastewater treatment.

UNIT-IV (8)

Air Pollution: Sources, classification and their effects, Air quality standards, dispersion of pollutants, control of air pollution, automobile pollution and its control.

UNIT-V (8)

Solid Waste Management: Sources and characteristics of solid waste, effects, Collection and transfer system, disposal methods.

Text Books:

1. M. Chandrasekhar, Environmental science, Hi Tech Publishers, 2009.
2. P.N. Modi (2006), Water supply Engineering – Environmental Engineering (Vol. I) – Standard Book House.
3. Gerard Kiely, Environmental Engineering, McGraw Hill Education Pvt Ltd, Special Indian Edition, 2007.

References:

1. W P Cunningham, M A Cunningham, Principles of Environmental Science, Inquiry and Applications, Tata McGraw Hill, Eighth Edition, 2016.

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Department of Electrical & Electronics Engineering

B. Tech. (EEE) III SEMESTER
EE-211
ELECTRICAL CIRCUITS - I

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT – I

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements — R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

UNIT – II

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Band-width and Q-factor.

UNIT – III

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem.(AC & DC).

UNIT – IV

Poly-phase Circuits: Analysis of balanced and unbalanced 3 - phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

UNIT – V

Transient analysis: Transient response of RLC circuits, Formulation of integral differential equations, Initial conditions, Response of RL, RC and RLC networks subjected to internal energy, Response to impulse, step, ramp, exponential and sinusoidal excitations.

Suggested Reading:

1. Van Valkenburg M.E., *Network Analysis*, Prentice Hall of India, 3rd Edition, 2000.
2. William Hayt H, Kimmerly Jack E, Steven Durbin M, *Engineering Circuit Analysis*, McGraw Hill, 6th Edition, 2002.
3. Jagan N.C, Lakshrninarayana C., *Network Analysis*, B.S. Publications, 3rd Edition, 2014.

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B. Tech. (EEE) III SEMESTER
EE-212
ELECTRICAL MACHINES – I

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT-I

Electromechanical energy conversion: Principle of energy conversion, Flow of energy in electro mechanical devices, Coupling-field reaction, Singly excited magnetic system – Electric energy input, Magnetic field energy stored, Mechanical work done – with slow, instantaneous and transient movement of armature, Calculation of mechanical force, Doubly excited magnetic systems, electromagnetic and reluctance torques.

UNIT-II

DC Machines: Simple loop generator, Essential parts of DC machine, Details of Lap winding &

Wave winding, EMF equation, Armature reaction — Remedies, Ampere turns, Commutation — reactance voltage, Methods of improving commutation — High resistance brushes, shifting of brushes, Interpoles, Compensating winding.

UNIT- III

DC Generators; Classification & types of DC generators, Open circuit, Internal & External characteristics — Critical resistance & critical speed, Voltage regulation, Conditions for self excitation, Causes of failure of voltage buildup, Parallel operation Series, Shunt and Compound generators, Applications.

UNIT- IV

DC Motors: Classification & Types of DC motors, Back emf, Speed regulation, Armature torque, Armature reaction, Operating characteristics, Performance curves, Basic speed control methods Shunt and Series motors, Three & four-point starters, Calculation of step resistances, Applications.

UNIT - V

Testing, Losses and Efficiency: Power losses — Copper losses and Rotational losses, Power flow, Efficiency, Testing - Brake Test and Swinburne’s test, Hopkinson’s test, Field’s test, Retardation test, Heat run test.

Suggested Reading

1. D.P. Kothari, I.J. Nagrath, *Electric Machines*, Tata McGraw Hill, 4th Edition, 2010
2. Bhimbra P.S., *Electrical Machinery*, Khanna Publications, 2000
3. Gupta J.B., *Theory and Performance of Electrical Machines*, S.K. Kataria & Sons, Delhi, 2005.
4. A.E. Clayton and N.N. Hancock, *The Performance and Design of Direct Current Machines*, 3rd edition, 1959.

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B. Tech. (EEE) III SEMESTER
EE-213
POWER SYSTEMS – I

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT- I

Economics of Power Generation: Load Curve, Load Demand and Diversified factors, Base

Load and Peak load operation, Types of costs and depreciation fund calculations, Methods of power factor improvement, Economics of power factor improvement, Tariffs, Distribution: 2 wire and 3 wire distributors, Ring mains, AC distribution calculations.

UNIT- II

Steam Power Stations: Choice of site, Layout & various parts of station, Boilers, Turbines,

Super Heaters, Economizers, Air pre-heaters etc. and their Pulverized fuel, Coal handling. **Hydro-Electric Power plants:** Estimation Hydrograph, Flow duration curve, Mass curve, Storage and pondage, Types electric plants and layouts, Prime movers for hydro -electric plants.

UNIT- III

Nuclear Power Plants: Fissile materials, Working principle of nuclear plants and reactor control, Shielding, Types of reactors.

Non-Conventional Energy Sources – Basic principles of Wind, solar and gas turbines..

UNIT - IV

Over-Head Lines: Supports sag and tension calculations, Effect of wind and ice, Erection conditions, Insulators: Types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, Testing of insulators. Insulated Cables: Conductors for cables, Insulating materials, Mechanical protection, Low voltage cables, Grading of cables, Three phase high voltage cables and Super voltage cables, Capacitance of three-core cables.

UNIT - V

Inductance and Capacitance of Transmission Lines: Inductance and capacitance of overhead line conductors, Single phase and three phase with symmetrical composite conductors, GMR and GMD Spacing, Transposition, Bundled conductors, Effect of earth capacitance.

TEXT BOOKS

1. WadhwaC.L., *Electrical Power Systems*, New Age International (P)Ltd.,4th Edition,2007.
2. WadhwaC.L., *Generation, Distribution and Utilization of Electrical Energy*, New Age International (P) Ltd., 4thEdition, 2006

Suggested Reading.

1. SinghS.N., *Electrical Power Generation, Transmission and Distribution*, Prentice Hall of India, Pvt. Ltd. New Delhi, 2003.
2. V.K.Mehta,*Principles of Power Systems*, S.Chand and Co., 2007.

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B. Tech. (EEE) III SEMESTER
EE-214
ELECTRO MAGNETIC FIELDS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT - I

Review of Vector Analysis: Coulomb’s Law, Electric field intensity, Electric field due to different charge distributions. Electric field due to line charge, Sheet charge, Volume charge distribution, Electric flux density, Gauss’s law, Divergence theorem,. Potential, Potential gradient, potential field of different charge distributions, Applications of above laws.

UNIT - II

Energy in electrostatic field, Poisson’s and Laplace equations, Uniqueness theorem, Solution of Laplace’s equation, Conductors, Dielectric capacitance, Conductor properties and Boundary conditions, Calculation of capacitance, Boundary conditions for conductors and perfect dielectric materials.

UNIT - III

Steady magnetic field, Biot-Savart’s law, Ampere’s law, Stoke’s theorem, Magnetic scalar vector potential Faraday’s law, Magnetic boundary conditions, Self and Mutual inductances, Force on moving charge, Force on differential elements, Magnetic circuits, Analogy with electrical circuits, Applications of above laws.

UNIT- IV

Maxwell’s equations in Integral form, Line and surface integrals, Application to static fields, Boundary conditions, Maxwell’s equations in differential forms, Continuity equation, Potential function for static fields, Field equations in vector forms, energy storage in electric and magnetic fields.

UNIT - V

EM waves in homogeneous medium solutions for free space conditions, Uniform plane wave propagation, Poisson’s and Laplace’s equations, Sinusoidally time varying uniform plane waves in free space, Uniform plane waves in dielectrics and conductors, Poynting vector, Power dissipation, Reflection of uniform plane waves, Introduction to method of moments, Method of images.

Suggested Reading

1. Matthew Sadiku N.O., *Elements of Electromagnetics*, Oxford University Press, 4th Edition, 2006.
2. William. Hayt H, Buck John A., *Engineering Electromagnetics*, Tata McGraw Hill, 7th Edition, 2003.
3. Nannapaneni Narayana Rao, *Elements of Engineering Electromagnetics*, PHI, New Delhi, 5th Edition, 2002.

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B. Tech. (EEE) III SEMESTER
EE-215
ANALOG ELECTRONICS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT I

Diode circuits (4 Hours)

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.

UNIT-II

BJT circuits (8 Hours)

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

UNIT-III

MOSFET circuits (8 Hours)

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier :small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

UNIT-IV

Differential, multi-stage and operational amplifiers (8 Hours)

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product).

UNIT-V**Applications of op-amp (8 Hours)**

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion: (Flash, Successive Approximation, Dual slope).

TEXT BOOKS

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

Suggested Reading:

3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
4. D.Roy Chowdary and Shail B Jain, "*Linear Integrated Circuits*", 3rd Edition, New Age International (P) Limited, New Delhi, 2008.

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B. Tech. (EEE) III SEMESTER
EE-216L
ANALOG ELECTRONIC LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

List of Experiments:

1. Characteristics of Semiconductor Diodes (Si, Ge and Zener).
2. Characteristics of BJT (CB, CE).
3. CRO and its Applications.
4. Rectifiers: Half Wave Rectifier, Full Wave Rectifier with and without filters
5. Characteristics of FET.
6. Transistors as an Amplifier.
7. Inverting, Non-Inverting Amplifier using Op amp.
8. RC phase shift Oscillator
9. Wien Bridge Oscillator
10. Integration and Differentiation using Op-amp.

Suggested Readings:

1. David Bell A., *Operational Amplifiers and Linear ICS*, Prentice Hall of India, 2005.
2. Maheshwari and Anand, *Laboratory Experiments and PSPICE Simulations in Analog Electronics*, 1st edition, Prentice Hall of India, 2006.

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B. Tech. (EEE) III SEMESTER
EE-217L
COMPUTER AIDED ELECTRICAL DRAWING LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

Drawing of the following using Electrical CADD / Corel Draw / MS Word / PPT/Visio

1. Lines, Arcs, Curves, Shapes, Filling of objects, Object editing & Transformation.
2. Electrical, Electronic & Electro – mechanical symbols.
3. House – wiring diagrams and layout.
4. Simple power and control circuit diagrams.
5. Electrical machine winding diagrams. (A.C & D.C)
6. Transmission tower, Over head lines – ACSR conductors, Single circuit, double circuit, and Bundle conductor.
7. Constructional features of D.C motors, AC motors and Transformers.
8. D.C and A.C motor starter diagrams.
9. Lamps used in illumination
10. Single line diagram of Power System

Suggested Readings:

1. KB.Raina, S.K.Bhattacharya,*Electrical Design, Estimating and Costing*, Wiley Eastern Ltd.,1991.
2. Nagrath, Kothari, *Electrical Machines*, TataMcGrawHillPublishingCompanyLtd.,2000.
3. A.K.Sawhney, *A Course in Electrical Machines Design*, Dhanpat Rai and Sons, 1996.

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B. Tech. (EEE) IV SEMESTER

Sl. No.	Category	Course code	Course title	Period/Week			Credits
				L	T	P	C
1	PCC	EE221	Electrical Circuits II	3	1	0	4
2	PCC	EE222	Electrical Machines - II	3	1	0	4
3	PCC	EE223	Power System-II	3	1	0	4
4	PCC	EE224	Power Electronics	3	1	0	4
5	PCC	EE225	Digital Electronics and Logic Design	3	0	0	3
6	PCC	EE226L	Electrical Circuits Laboratory	0	0	2	1
7	PCC	EE227L	Electrical Machines Laboratory-I	0	0	2	1
8	PCC	EE228L	Digital Electronics and Logic Design Laboratory	0	0	2	1
9	MC	MC-220	Constitution of India	2	0	0	0
TOTAL CREDITS				17	4	7	22

[L= Lectures, T= Tutorials, P= Practical, C= Credits]

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B. Tech. (EEE) IV SEMESTER
MC-220
CONSTITUTION OF INDIA

Course code	MC				
Category	Mandatory Course				
Course title	CONSTITUTION OF INDIA				
Scheme and Credits	L	T	P	Credits	Internal marks =30
	2	0	0	0	External Marks = 70

- UNIT -1:**
1. Making of Indian Constitution - Constituent Assembly
 2. Historical Perspective of the Constitution of India
 3. Salient Features and characteristics of the Constitution of India

- UNIT -2:**
1. The Fundamental Rights
 2. The Fundamental Duties and their Legal Status
 3. The Directive Principles of State Policy – Their Importance and Implementation

- UNIT -3:**
1. Federal Structure and Distribution of Administrative, Legislative and Financial Powers between the Union and the States
 2. Parliamentary Form of Government in India – The Constitutional Powers and Status of the President of India
 3. Amendment of the Constitutional Provisions and Procedure

- UNIT -4:**
1. The Judiciary
 2. Constitutional and Legal Frame Work for Protection of Environmental in Global and National Level
 3. Corporate Social Responsibility (CSR) International and National Scenario.

Text Books:

1. D.D. Basu: An Introduction of Indian Constitution
2. Greanvile Austin: The Indian Constitution
3. Paras Diwan: Studies on Environmental cases

References Books:

1. Khanna Justice.H.R: Making of India's Constitution, Eastern Book Companies.
2. Rajani Kothari: Indian Politics
3. Ghosh Pratap Kumar: The Constitution of India. How it has been Formed, World Press.
4. A.Agrawal (Ed): Legal Control of Environmental Pollution.

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B. Tech. (EEE) IV SEMESTER
EE-221
ELECTRICAL CIRCUITS – II

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT I

Fourier Series and Integral: Fourier series representation of periodic functions, Symmetry conditions, Exponential Fourier series, Discrete spectrum, Fourier integral and its properties, Continuous spectrum, Application to simple networks

UNIT II

Laplace Transform Method of Analysis of Networks: Definition of Laplace pair, Evaluation of Laplace transform of common time function, Laplace properties and theorems, Convolution theorem, Waveforms synthesis, Partial fraction method of inverse transforms, Application to networks, Transfer functions.

UNIT III

Two port network parameters: Open circuit impedance, Short circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks, System function, Impedance and admittance functions

UNIT IV

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-set matrix, Formulation of node equations, loop equations, cut-set equations for RLC networks. **Network synthesis** of driving point functions, Positive real function, properties of PR functions, Testing of PR functions

UNIT V

Synthesis of LC, RC, RL functions, Properties of LC, RC and RL networks, Minimum Functions, Synthesis of RLC networks, Brune's method, Properties of networks in terms of poles and zero.

Suggested Reading:

1. VanValkenburgM.E, *Network Analysis*, Prentice Hall of India, 3rdEdition,2000.
2. WilliamHaytH,KimmerlyJackE.andStevenDurbinM,*EngineeringCircuitAnalysis*,McGraw Hill, 6th Edition,2002
3. JaganN.C,Lakshrninarayana C.,*NetworkAnalysis*,B.S.Publications,3rdEdition,2014.
4. ChakravarthyA.,*CircuitTheory*,DhanpatRai&Co.,FirstEdition,1999

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B. Tech. (EEE) IV SEMESTER

EE-222

ELECTRICAL MACHINES –II

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT-I

Single Phase Transformers: Constructional features of single phase transformers, principle of two winding transformer, ideal transformer - transformer on no load and on load - phasor diagrams • equivalent circuits, losses, Testing - Polarity test, OC and SC tests, Sumpner's test, Regulation and efficiency, All day efficiency, separation of losses - Excitation phenomena in transformers, Auto transformer - Comparison with two winding transformer and applications.

UNIT-II

Three - Phase Transformers: Connections - Choice of transformer connections – Third harmonic voltages - Phase conversion - 3-phase to 2-phase transformation, Scott connection - constructional features of poly phase transformers - Tertiary winding, Parallel operation of transformers, phase shifting transformer, Tap changer.

UNIT-III

Three - Phase Induction Motor: Constructional features - Rotating magnetic field theory, Principle of operation of Squirrel cage and Slip ring motors, Phasor diagram, Equivalent Circuit – expression for torque - starting torque - Max torque. Slip-torque characteristics, Equivalent circuit parameters from no-load and blocked rotor test, Circle diagram, Determination of performance characteristics of induction motor, Applications.

UNIT-IV

Starting & Speed Control Methods: Starting methods of 3-phase induction motor –Auto transformer, Star-delta Starter. Double cage machine, Speed control methods – Resistance control, Voltage Control, Pole changing, Cascading, Induction Generator - Principle of operation, Applications.

UNIT-V

Single Phase Motors: Double field revolving theory. Equivalent circuit of single phase induction Motor- Principle of operation, speed torque characteristics of a split phase and capacitor motors. Compensated and uncompensated series motor, Repulsion motor and universal motor - Applications.

Suggested Reading:

1. P.S.Bimbhra-Electrical Machinery, KhannaPublishers2006
2. D.P.Kothari&I.J.Nagrath, Electrical Machines, Tata McGraw Hill, 4th Edition, 2010.
3. M.G.Say-ThePerformanceandDesignofAC.MachinesPitmanPublication, 2002.
4. IrvingL. Kosow-Electric Machinery and Transformers. PPH, Pearson Education 2nd Edition, 2009.

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B. Tech. (EEE) IV SEMESTER
EE-223
POWER SYSTEMS – II

Teaching Scheme				Examination Scheme	
L	T	P	C	Internal Marks	External Marks
3	1	0	4	30	70

UNIT-I

Transmission Line Theory: Performance of short, medium, long lines - Line calculations - Tuned lines, Power circle diagram and their applications. Corona - Causes - Disruptive and Visual critical voltages - Power loss - Minimization of corona effects.

UNIT-II

Symmetrical Faults: Use of per unit quantities in power systems, advantages of per unit system. Symmetrical Three-phase Faults, Transients in RL series circuits - Short circuit currents - Reactance's of synchronous machines - Symmetrical fault calculations, Short circuit capacity of bus.

UNIT-III

Unsymmetrical Faults: Symmetrical components of unsymmetrical phasors - Power in terms of symmetrical components - Sequence impedance and sequence networks, Sequence networks of unloaded generators - Sequence impedances of circuit elements - Single line to ground, line to line and double line to ground faults on unloaded generator - Unsymmetrical faults of power systems, Open circuit faults.

UNIT-IV

Voltage Control: Phase modifiers, Induction Regulators -Tap changing Transformers, Series and Shunt Capacitors, Reactive Power requirement calculations, Static VAR compensators - Thyristor Controlled reactor, Thyristor switched capacitor.

UNIT-V

Travelling Wave Theory : Causes of over voltages - Travelling wave theory - Wave equation - Open circuited line - The short circuited line - Junction of lines of different natural impedances - Reflection and Refraction Coefficients - Junction of cable and over head lines - Junction of three lines of different natural impedances- Bewley Lattice diagram.

SUGGESTED READINGS:

1. CLWadhwa-ElectricalPowerSystems,NewAgeInternational,4thedition,2006.
2. GraingerandStevenson-PowerSystemAnalysis,TataMcGrawHill,4thedition,2003.
3. NagarathandKothari-ModernPowerSystemAnalysis,TataMcGrawHill,4thedition-2012.

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B. Tech. (EEE) IV SEMESTER
EE-224
POWER ELECTRONICS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT-I

Power Semiconductor Diodes and Transistors : Power Switching Devices - Ideal Switches, Real Switches, Classification of Power Switching devices, Types of power diodes – Their characteristics and applications, Bipolar Junction transistors - Power MOSFETS, IGBT, BJT and GTO operation and switching characteristics - Comparison of BJT, MOSFET and IGBT – Their applications.

UNIT-II

SCRs - Static and Dynamic Characteristics : Two transistor analogy, SCR trigger circuits R, RC and UJT triggering circuits - Triggering circuits for Single phase bridge rectifier and Choppers, The various commutation methods of SCRs - Cooling and mounting techniques of devices, Introduction to heat pipe cooling.

UNIT-III

Controlled Rectifiers : Single phase (continuous & discontinuous) and three phase (continuous) half controlled and fully controlled bridge rectifiers with R, RL, and RLE loads, Effect of source inductance, Dual converters - circulating current mode and circulating current free mode.

UNIT-IV

Choppers and Cycloconverters: Classification of Choppers• A,B,C,D,E - Step-up chopper -

Switched mode regulators - Study of Buck, Boost and Buck-Boost regulators, Principle of operation of single phase bridge type Cycle-converters and their applications.

UNIT-V

Inverters and Voltage controllers : Single phase Inverters, Three phase bridge inverters (180° and 120° modes) - Voltage control of Inverters - Single pulse width modulation - Multiple pulse width modulation- Sinusoidal pulse width modulation, Comparison of VSI and CSI – Single phase and 3-phase AC voltage controller with R, RL loads.

Suggested Reading:

1. Bimbira.P.S.- PowerElectronics, KhannaPublications,2006.
2. RashidM.H.- Power Electronics Circuits, Devicesand Applications- Prentice Hall of India, 2004.
3. Singh.M.D., KhanchandaniK.B.-PowerElectronics-TataMcGrawHill,14th reprint,1999.
4. Mohan, Undeland &Robbins-Power Electronic Converters. Applications and Design–John Wiley & Sons - 3rdEdition, 2007.

Faculty of Engineering & Technology
KAKATIYA UNIVERSITY, WARANGAL-506 009
Department of Electrical & Electronics Engineering

B. Tech. (EEE) IV SEMESTER

EE-225

DIGITAL ELECTRONICS AND LOGIC DESIGN

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT I

Boolean algebras and combinational logic, AND, OR and NOT operations. Laws of Boolean algebra, Minimization of Boolean expressions, Truth tables and maps. Sum of products and product of sums, Map method of reduction, Incompletely specified functions, Multiple output minimization.

UNIT II

Tabular minimization, Digital logic families and IC's, Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family, Totem pole, Open collector outputs, wired AND Operation, Comparison of performance, TTL sub-families, Multiplexer and dc-multiplexer, Encoder and decoder, Code converters, Implementation of combinational logic using standard logic gates and multiplexers.

UNIT III

Binary arithmetic and circuits, Half and Full adder, Subtractor and Magnitude comparator, Number complements, Two's complement arithmetic, Carry look ahead adder, Decimal numbers and their codes, BCD and Excess -3 arithmetic

UNIT IV

Synchronous Sequential Circuits: basic latch circuits, Debouncing switch, SR, JK, D and T flip-flops, Truth table and execution table, Ripple and Synchronous counters, Up/down counters, General BCD counter, Shift registers, ring counters

UNIT V

A/D and D/A Converters: Converter types — Tracking type, Flash type, Successive approximation type: R-2R ladder, Weighed register type, switched current source type, Switched capacitor type

Suggested Reading:

1. Anand Kumar A., *Fundamentals of Digital Circuits*, Prentice Hall of India, 4th Edition, 2003.
2. Morriss Mano M., *Digital Design*, Prentice Hall of India, 3rd Edition, 2002.
3. Zvykohavi, *Switching & Finite Automata Theory*, Tata McGraw Hill, 2nd Edition, 19

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B. Tech. (EEE) IV SEMISTER
EE-226L
ELECTRICAL CIRCUITS LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

List of Experiments:

1. Charging and Discharging Characteristics of RC and RL series circuits.
2. Locus diagrams of RC and RL Circuits.
3. Frequencies Response of a Series RLC Circuits.
4. Frequencies Response of a Parallel RLC Circuits.
5. Parameters of two port network.
6. Series, parallel and cascade connection of two port networks.
7. Verification of Theorems.
 - (a) Thevenin's theorem (b) Norton's theorem
 - (c) Superposition theorem
 - (d) Maximum power transfer theorem
8. Two Wattmeter method.
9. Transients in RLC circuits.
10. Network Synthesis.
11. Characteristics of Linear, Non-Linear and Bilinear Elements.

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Department of Electrical & Electronics Engineering

B. Tech. (EEE) IV SEMISTER
EE-227L
ELECTRICAL MACHINES LABORATORY – I

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

LIST OF EXPERIMENTS

1. Magnetization characteristics of a separately excited D.C. generator.
2. Determination of the load characteristics of shunt and compound generators.
3. Determination of the performance and mechanical characteristics of series, shunt and compound motors.
4. Separation of iron and friction losses and estimation of parameters in D.C. machine.
5. Speed control of D.C. Shunt motor using shunt field control and armature control methods.
6. Separation of core losses in a single phase transformer.
7. Open circuit and short circuit and load test on a single phase transformer.
8. Sumpner's test on two identical transformers.
9. Three phase Transformer connections.
10. Three phase to two phase transformation and open delta connection.
11. Retardation test.
12. Hopkinson's test.
13. Swinburne's test.

Note: At least ten experiments should be conducted in the Semester.

Suggested Reading:

- 1.P.S.Bimbhra-ElectricalMachinery,KhannaPublishers2006
- 2.D.P.Kothari&I.J.Nagrath,ElectricalMachines,TataMcGrawHill,4thEdition,2010.
- 3.M.G.Say-ThePerformanceandDesignofAC.MachinesPitmanPublication,2002.
- 4.IrvingL.Kosow-ElectricMachineryandTransformers.PPH,PearsonEducation, 2nd Edition, 2009

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B. Tech. (EEE) IV SEMISTER
EE-228L
DIGITAL ELECTRONICS AND LOGIC DESIGN LABORATORY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

LIST OF EXPERIMENTS

1. Combinational logic function realization.
2. Realization of 4 bit binary adder / subtracter.
3. Construction of Decimal to Binary encoder, BCD to Binary, Binary to BCD, BCD 10 Excess- 3.
4. Serial/parallel input shift registers.
5. 4-bit binary up-down counter.
6. *555 timer applications.*
7. *Op-Amp applications - Integrator, Adder, summer.*
8. *Active filters - Low pass filter & High pass filter*
9. *Clippers and Clampers using Op-Amps.*
10. *Study of 723 linear voltage regulator and fixed voltage regulator.*
11. *Generation of triangular and square wave using Op-Amp.*
12. *Schmitt triggers circuit.*

Note: At least ten experiments should be conducted in the semester.

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B. Tech. (EEE) V SEMESTER

S. No.	CourseCode	Course Title	Scheme of Instruction			Lecturer hrs/week	Scheme of Examination		Credits
			L	T	P		CI E	SEE	
1	PC3101EE	Linear Control Systems	3	1	0	4	30	70	4
2	PC3102EE	Electrical Machines-III	3	1	0	4	30	70	4
3	PC3103EE	Linear IC Applications	3	0	0	3	30	70	3
4	PE-I	Professional Elective-I	3	0	0	3	30	70	3
5	PC3107EE	Measurements and Instrumentation	3	1	0	4	30	70	4
6	HSMC3108	Managerial Economics and Accountancy	3	0	0	3	30	70	3
8	PC3109EE	Electrical Machines-II Laboratory	0	0	2	2	25	50	1
10	PC3110EE	Measurements and Instrumentation Laboratory	0	0	2	2	25	50	1
		Total	18	3	4	25	230	520	23

(PE-I) Professional Elective – I

1. PE3104EE Utilization of Electrical Energy
2. PE3105EE High Voltage Engineering
3. PE3106EE Electric Machine Design

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Department of Electrical & Electronics Engineering

B. Tech. (EEE) V SEMESTER

PC3101EE
LINEAR CONTROL SYSTEMS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT-I

Introduction to Control Systems: Classification of control systems. Feed-Back Characteristics, Effects of feedback - Mathematical modeling of Electrical and Mechanical systems -Transfer function- Transfer function of Potentiometer, synchro, AC servo motor, DC servo motor - Block diagram reduction technique - Signal flow graph, Masson's gain formula

UNIT-II

Time Domain Analysis: Standard test signals - Time response of first order systems - Transient response of second order system for unit step input, Time domain specifications - Steady state response - Steady state errors and error constants - Effects of P, PD, PI and PID controllers.

UNIT-III

Stability Analysis in S-Domain:The concept of stability - Routh's stability Criterion, Absolute stability and relative stability- limitations of Routh's stability.

Root Locus Technique: The root locus concept - construction of root loci- Effects of adding poles and zeros on the root loci.

UNIT-IV

Frequency Response Analysis: Introduction to frequency response - Frequency domain specifications - Bode plot - Stability analysis from Bode plots - Determination of transfer function from the Bode Diagram - Polar Plots, Nyquist Plots, Stability Analysis, Gain margin and phase margin.

Control System Design: Introduction - Lag, Lead and Lag-Lead Compensator design infrequency Domain.

UNIT-V

State Space Analysis: Concepts of state, State variables and state model, Derivation of state models of linear time invariant systems - Controllable, Observable and Diagonal state models - State transition matrix - Solution of state equation - Concepts of Controllability and Observability.

Text Book:

1. I.J.Nagrath & M.Gopal, Control System Engineering, 4th ed., New Delhi: New Age International Pvt. Ltd.,2012

Reference Books:

1. B.C.Kuo - Automatic Control Systems, Wiley India edition, 7th Edition, 2002.
2. K.Ogata - Modern Control System, Prentice Hall of India, 4th edition, 2002.
3. N.C.Jagan - Control Systems, B.S Publications, 2nd edition, 2008.
4. S.Palani, Control Systems Engineering, 2nd ed., New Delhi: Tata McGraw Hill Education (India) Pvt.Ltd.
5. A.Anand Kumar, control systems, 2nd ed., New Delhi: Prentice Hall of India, 2014
6. A.Nagoorkani, Control Systems, 2nd ed., New Delhi: RBA Publications'.

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B. Tech. (EEE) V SEMESTER

PC3102EE

Electrical Machines - III

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

UNIT - I

Synchronous machines: Constructional features of round rotor and salient pole machines-Armature winding-integral slot and fractional slot winding-Distribution, pitch and winding factors-EMF equation-Harmonics in generated EMF, suppression of harmonics-Armature reaction-leakage reactance-Synchronous Impedance.

UNIT - II

Synchronous Generator: Voltage Regulation – Phasor diagram of round rotor synchronous generator-Load characteristics-Regulation by synchronous Impedance method, MMF method, ZPF method and ASA method.

Salient pole synchronous generators-two reaction theory-experimental determination of X_d and X_q (Slip Test)-phasor diagrams

UNIT-III

Parallel operation of Synchronous machines- Synchronization of alternators with infinite bus bars-Synchronizing power and torque-parallel operation and load sharing-effect of change of excitation and mechanical power input.

Short-circuit analysis on alternators-determination of sub-transient, transient and steady state reactance.

UNIT- IV

Synchronous Motors: Theory of operation-phasor diagram-variation of current and power factor with excitation-hunting and its suppression-starting methods-synchronous condenser-circle diagrams-applications.

UNIT-V

Special Machines: Brushless D.C. Motors: Construction & Principle of Operation, Torque equation, Torque -angle Characteristics. Switched Reluctance Motor: Constructional features, Principle of operation, Torque production, Torque - angle characteristics, various operating modes of SRM.

Permanent Magnet Synchronous Motor: Construction, principle operation of PMSM and their operating characteristics.

Text Books:

1. Bhimbra P.S., Electrical Machinery., 7th Ed. New Delhi: Khanna Publishers-2014

Reference Books:

1. Kothari D.P. & Nagrath I.J. - Electrical Machines - Tata McGraw Hill, 2004.
2. Bhimbra P.S. - Generalized Theory of Electrical Machines, Khanna Publications, 2000.
3. Say MG. - The Performance and Design of AC. Machines - Pitman Publication, 2002.
4. Irving L. Kosow - Electric Machinery and Transformers, PPH, Pearson Education, 2nd Edition. 2009.

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B. Tech. (EEE) VI SEMESTER

PC3103EE

LINEAR IC APPLICATIONS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT – I

Operational amplifiers: Characteristics, Open loop voltage gain, Output impedance, Input impedance, Common Mode Rejection Ratio - Offset balancing techniques - Slew rate, Frequency response - Basic applications - Inverter summer, Analog integrator, Differentiator, Current to voltage converter, Voltage to current converter, Voltage follower, a.c. amplifier.

UNIT – II

Circuits using Op-amps: Voltage limiter, Clipper and Clamper, Precision rectifier-full wave and half wave, Peak detector, Comparator, Zero crossing detector, Schmitt trigger, Monostable, astable and bistable multivibrators, Multiplier, Divider, Difference amplifier, Instrumentation amplifier.

UNIT – III

Waveform generation using Op-amps: Sine, Square, Triangular and Quadrature oscillators, 555 timer - Functional diagram, Operation as monostable and astable, Voltage to frequency converter using 555, 565.

UNIT – IV

Voltage regulators using Op-amp: Series voltage regulators - Shunt regulators using Op-amp - Switching regulators using Op-amp, Buck, Boost, Buck-boost regulators, Regulators using IC 723 - Dual voltage regulator - Fixed voltage regulators - Current sensing and current fold back protection.

UNIT – V

RC active filters: Butterworth - First order - Second order for low pass - High pass - Band pass - Band reject - Notch - State variable filter - Switched capacitor filter - Universal filter - Power amplifiers - Power boosters, Monolithic power amplifier features.

Suggested Reading:

1. Gayakwad W.A. Op-Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall of India, 2002.
2. Malvino Albert Paul, Electronic Principles, 6th Edition, Tata McGraw Hill, 1999.
3. Roy Choudhury, Shail Jam - Linear integrated Circuits, New Age International, 2nd Edition, 2003.
4. William D. Stanley, OP Amps with Linear Integrated Circuits, Pearson, 2000.

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B. Tech. (EEE) V SEMESTER

PE3104EE

UTILIZATION OF ELECTRICAL ENERGY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT I

Industrial Heating: Advantages and methods of electric heating. Description, operation and performance of resistance ovens - Design of elements. Core type, Coreless type furnaces, High frequency eddy current heating, Dielectric heating. Arc furnace.

Electric welding: Resistance welding, welding transformer and its rating, various types of Electric arc welding and electric resistance welding.

UNIT II

Schematic Utilization and Connection Diagrams for Motor Control: Two supply sources for 3 phase Induction motors. Direct reversing, remote control operation, and jogging operating of Induction motor. Contactor control circuit. Push button control stations. Over load relays, limit switches, float switches. Interlocking methods for reversing control.

UNIT III

Illumination: Introduction, nature and production of light, Sensitivity of the eye, Units of light. The inverse square law and cosine law, Solid angle, Lighting calculations - Determination of M.S.C.P, Rouseau's construction, Discharge lamps, Sodium vapour lamps, Mercury vapour lamps - Fluorescent lamp, LED lamp, starting and power factor corrections, stroboscopic effects - Neon signs, Application to factory lighting, Street lighting and Flood lighting.

UNIT IV

Electric Traction: System of Electric Traction - Transmission of drive - Systems of track electrification - Traction mechanics - Speed time curves - Tractive effort - Specific energy consumption - Mechanics of train movement -Coefficient of adhesion.

Traction Motors: Desirable characteristics, d.c series motors, a.c series motors 3-phase induction motors, d.c motor series and parallel control, Energy saving.

UNIT V

Train Lighting: Systems of train lighting - Special requirements of train lighting - Methods of obtaining unidirectional polarity - Methods of obtaining constant output - Single battery system - Double battery parallel block system - Principal equipment of double battery system - Coach wiring - Dynamo.

Batteries: Lead acid batteries, SMF batteries, Construction and maintenance, Charging and rating of batteries.

Suggested Readings:

1. Partab H, *Art and Science of Utilization of Electric Power*, Dhanpat Rai & Sons, 1997.
2. K.B. Raina and S.K. Bhattacharya, *Electrical Design, Estimating and Costing*, Wiley Eastern Ltd., 1991.
3. Partab H, *Modern Electric Traction*, Dhanpat Rai & Sons, 2000.

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B. Tech. (EEE) V SEMESTER

PE3105EE

HIGH VOLTAGE ENGINEERING

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT – I

Breakdown in Gases

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

Breakdown in Liquid and Solid Insulating Materials

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT – II

Generation of High Voltages

Generation of high voltages, generation of high D.C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT- III

Measurements of High Voltages and Currents

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT – IV

LIGHTNING AND SWITCHING OVER-VOLTAGES

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching over voltages, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT – V

High Voltage Testing of Electrical Apparatus and High Voltage Laboratories Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment,

High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXT BOOKS:

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education,2013.
2. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers,2007.

REFERENCES:

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), “High Voltage Engineering Fundamentals”, Khanna Publishers,1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”, Newnes Publication,2000.
3. R. Arora and W. Mosch “High Voltage and Electrical Insulation Engineering”, John Wiley & Sons,2011.
4. Various IS standards for HV Laboratory Techniques andTesting

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B. Tech. (EEE) V SEMESTER

PE3106EE

ELECTRIC MACHINE DESIGN

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

INTRODUCTION

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT-II

TRANSFORMERS

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT-III

INDUCTION MOTORS

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-IV

SYNCHRONOUS MACHINES

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT-V

COMPUTER AIDED DESIGN (CAD)

Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines- PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.

REFERENCES:

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2. K. L. Narang, "A Text Book of Electrical Engineering Drawings", Satya Prakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
4. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

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B. Tech. (EEE) V SEMESTER

PC3107EE

MEASUREMENTS AND INSTRUMENTATION

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks:70

UNIT- I

Introduction and Error Analysis: Significance of measurement, static characteristics of measuring system-linearity, sensitivity, precision, accuracy, errors in measuring instruments.

Voltage and Current Measuring Instruments: Construction, operation, torque equation, sensitivity, errors, advantages and disadvantages of Permanent Magnet Moving Coil (PMMC) instrument, Moving Iron (MI) instruments and electro-dynamometer type instruments, extension of ranges of voltmeters and ammeter, loading effect on measuring instruments.

UNIT- II

Measuring of Power, Energy and Power factor: Construction, operation, torque equation, errors, advantages and disadvantages of dynamometer type wattmeter, induction type energy meter, measurement of three phase active and reactive power, phantom loading, introduction to static energy meter and smart energy meter.

UNIT- III

DC Bridges: Measurement of unknown resistance using Wheatstone bridge, Kelvin's double bridge, Mega ohm bridge and megger.

AC Bridges: Measurement of unknown inductance using Maxwell's bridge, Anderson's bridge, Hay's bridge, Wien's bridge and Owen's bridge, measurement of unknown capacitance using De Sauty's bridge, Schering bridge.

UNIT- IV

Instrument Transformers: Introduction, uses, ratios and burden, current transformers-construction and errors, effect of secondary open circuit, potential transformers- construction and errors, testing of current transformers with Silsbee's method, Introduction to Hall effect current sensor.

Potentiometers: Construction, standardization and applications of DC potentiometers, construction and operation of phase shifting transformer and phase shifting circuit, construction, standardization and operation of polar and coordinate type AC potentiometers, applications of AC potentiometers

UNIT-V

Electronics Instruments: Construction and operation of Cathode Ray Oscilloscope (CRO), electrostatic deflection system, horizontal and vertical amplifiers, screens and probes used in CRO, deflection sensitivity and deflection factor, measurement of unknown frequency and phase using Lissajous patterns, construction and operation of Digital Voltmeters (DVM), block diagram representation of Digital Storage Oscilloscope (DSO).

Transducers: Introduction and classification of transducers, theory of Strain gauges, thermocouples, Linear Variable Differential Transformer (LVDT).

TEXT BOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005
2. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

REFERENCES:

1. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
2. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
3. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
4. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.
5. U.A. Bakshi, A.V. Bakshi, "Electrical Measurements and Instrumentation, Pune: Technical Publications, 2009.

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B. Tech. (EEE) VSEMESTER

HSMC3108

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

Meaning and Nature of Managerial Economics: Managerial Economics and its usefulness to Engineers, Fundamental Concepts of Managerial Economics-Scarcity, Marginalism, Equimarginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT-II

Consumer Behavior: Law of Demand, Determinants, Types of Demand; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply and Concept of Equilibrium.

UNIT - III

Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price - Output determination under Perfect Competition and Monopoly.

UNIT-IV

Capital Management: Significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems.

UNIT-V

Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts, Trial Balance, concept and preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.

Suggested Reading:

1. Mehta P.L., Managerial Economics - Analysis, Problems and Cases, Sulthan Chand & Sons Educational Publishers, 2011
2. Maheswari S.N., Introduction to Accountancy, Vikas Publishing House, 2005
3. Pandey I.M., Financial Management, Vikas Publishing House, 2009

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B. Tech. (EEE) V SEMESTER
PC3109EE
ELECTRICAL MACHINES-II LAB

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

LIST OF EXPERIMENTS:

1. No-load test and blocked rotor test on 3-phase induction motor.
2. Speed control of 3-phase induction motor by (a) Cascade connection (b) Pole changing.
3. Speed control of 3-phase induction motor by (a) Rotor resistance control (b) Slip power recovery scheme.
4. Brake test on 3 phase induction motor to find the performance.
5. Power factor improvement of three phase Induction motor using capacitors.
6. Performance characteristics of single-phase induction motor.
7. Voltage regulation of an alternator by (a) Synchronous impedance method (b) Ampere - turn method (c) Z.P.F. method.
8. Voltage regulation of an alternator by Z.P.F. method.
9. Determination of load characteristics of an alternator
10. Determination of X_d and X_q of salient pole synchronous machine by conducting slip test.
11. Determination of V curves and inverted V curves of synchronous motor.
12. Power angle characteristics of a synchronous machine.
13. Speed control of BLDC motor.
14. Speed control of SRM motor.
15. Dynamic braking of 3-phase induction motor

Note: At least ten experiments should be conducted in the Semester.

Suggested Reading:

1. Kothari D.P. & Nagrath I.J. - Electrical Machines - Tata McGraw Hill, 2004.
2. Bhimbra P.S. - Generalized Theory of Electrical Machines, Khanna Publications, 2000.
3. Peddapelli Satish Kumar & Sridhar Gaddam – Electrical Machines-a practical approach, De-gruyter publications, Germany.
4. Say MG. - The Performance and Design of AC. Machines - Pitman Publication, 2002.
5. Irving L. Kosow - Electric Machinery and Transformers, PPH, Pearson Education, 2nd Edition. 2009.

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B. Tech. (EEE) V
SEMESTER PC3110EE
MEASUREMENTS AND INSTRUMENTATION LAB

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

The following experiments are required to be conducted as Compulsory experiments

1. Calibration and Testing of single-phase energyMeter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMCvoltage meter.
4. Kelvin’s double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testingKit.
6. Schering Bridge & AndersonBridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

9. Measurement of frequency and Phase angle using Lissajous figures.
10. Measurement of frequency using CRO.
11. Measurement of 3 - Phase power with three wattmeter method.
12. Measurement of strain using strain gauge
13. Transformer turns ratio measurement using AC bridges.
14. Measurement of % ratio error and phase angle of given CT by comparison.

TEXT BOOKS:

1. “G. K. Banerjee”, “Electrical and Electronic Measurements”, PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. “S.C. Bhargava”, “Electrical Measuring Instruments and Measurements”, BS Publications, 2012.

REFERENCES:

1. “A. K. Sawhney”, “Electrical & Electronic Measurement & Instruments”, Dhanpat Rai & Co. Publications, 2005.
2. “R.K. Rajput”, “Electrical & Electronic Measurement & Instrumentation”, S. Chand and Company Ltd., 2007.
3. “Buckingham and Price”, “Electrical Measurements”, Prentice – Hall, 1988.
4. “Reissland, M.U”, “Electrical Measurements: Fundamentals, Concepts, Applications”, New Age International (P) Limited Publishers, 1st Edition 2010.
5. “E.W. Golding and F. C. Widdis”, “Electrical Measurements and measuring Instruments”, fifth Edition, Wheeler Publishing, 2011.

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B. Tech. (EEE) VI SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Lecture hrs/week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1	PC3201EE	Power Semiconductor Drives	3	1	0	4	30	70	4
2	PC3202EE	Switchgear and Protection	3	0	0	3	30	70	3
3	PC3203EE	Power System Operation and Control	3	1	0	4	30	70	4
4	PE-II	Professional Elective-II	3	0	0	3	30	70	3
5	PC3208EE	Signals and Linear Systems	3	0	0	3	30	70	3
6	PC3209EE	Microprocessor Systems	3	0	0	3	30	70	3
7	PC3210EE	Microprocessor Systems Laboratory	0	0	2	2	25	50	1
8	PC3211EE	Linear Control Systems Laboratory	0	0	2	2	25	50	1
	Summer Internship(Six weeks during summer vacation)		--	--	--	--	--	--	--
	Total		18	2	4	24	230	520	22

(PE-II) Professional Elective – II

1. PE3204EE Electrical Distribution System
2. PE3205EE Electrical Energy Conservation and Auditing
3. PE3206EE Hybrid electric vehicles
4. PE3207EE MOOCS Course*

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B. Tech. (EEE) VI SEMESTER

PC3201EE

POWER SEMICONDUCTOR DRIVES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	1	0	4	External Marks: 70

UNIT – I

Introduction

Block diagram of Electrical drive-Dynamics of Electrical Drives-Four quadrant operation-Steady state stability-Load equalization

Control of DC Motors:

Single Phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed-Torque Characteristics- Problems, three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – output voltage and current waveforms – Speed-Torque characteristics – Problems.

UNIT - II

Electric Braking – Plugging, Dynamic, and Regenerative Braking operations- Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only)

Control of DC Motors By Choppers: Single quadrant, Two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only)

UNIT - III

Control of Induction Motor

Braking of induction motor: analysis of AC dynamic braking and DC dynamic braking
Variable voltage characteristics-Control of Induction Motor by AC Voltage Controllers – Waveforms – speed torque characteristics, Variable frequency characteristics- Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

UNIT - IV**Rotor Side Control of Induction Motor**

Static rotor resistance control – closed loop operation of slip ring induction motor with static rotor resistance control -Slip power recovery – Static Scherbius drive – Static Kramer Drive and its closed loop control – advantages, applications, problems.

UNIT - V**Control of Synchronous Motors**

self-controlled and separately controlled synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and cycloconverters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop speed control scheme for load commutated inverter fed synchronous motor drives (Block Diagram Only)

TEXT BOOKS:

1. “G K Dubey”, Fundamentals of Electric Drives, CRC Press, 2002.
2. “Vedam Subramanyam”, Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

REFERENCES:

1. “SK Pillai”, A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. “P. C. Sen”, Thyristor DC Drives, Wiley-Blackwell, 1981
3. “B. K. Bose”, Modern Power Electronics, and AC Drives, Pearson 2015.
4. “R. Krishnan”, Electric motor drives - modeling, Analysis and control, Prentice Hall PTR, 2001

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B. Tech. (EEE) VI SEMESTER

PC3202EE

SWITCHGEAR AND PROTECTION

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks: 30
3	0	0	3	External Marks: 70

UNIT-I

PROTECTIVE RELAYS

Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology.

OPERATING PRINCIPLES AND RELAY CONSTRUCTION: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.

UNIT-II

OVER-CURRENT PROTECTION

Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.

DISTANCE PROTECTION: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays, MHO relay with blinders, Reduction of measuring units, switched distance schemes, auto re-closing.

UNIT-III

PILOT RELAYING SCHEMES

Wire Pilot protection, Carrier current protection.

AC MACHINES AND BUS ZONE PROTECTION: Protection of Generators, Protection of transformers, Bus-zone protection, frame leakage protection.

UNTI-IV**STATIC RELAYS**

Amplitude and Phase comparators, Duality between AC and PC, Static amplitude comparator, integrating and instantaneous comparators, static phase comparators, coincidence type of phase comparator, staticover current relays, static directional relay, static differential relay, static distance relays, Multi input comparators, concept of Quadrilateral and Elliptical relay characteristics.

MICROPROCESSOR BASED RELAYS: Advantages, over current relays, directional relays, distance relays.

UNTI-V**CIRCUIT BREAKERS**

Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage d.c. breakers, ratings of circuit breakers, testing of circuitbreakers.

FUSES: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXT BOOKS:

1. Badriram and D.N. Vishwakarma, Power System Protection and Switchgear, TMH2001.
2. U.A.Bakshi, M.V.Bakshi: Switchgear and Protection, Technical Publications,2009.

REFERENCES:

1. C.Russel Mason – “The art and science of protective relaying, Wiley Eastern,1995
2. L.P.Singh “Protective relaying from Electromechanical to Microprocessors”, New Age International

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B. Tech. (EEE) VI SEMESTER

PC3203EE

POWER SYSTEM OPERATION AND CONTROL

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	1	0	4	External Marks :70

UNIT – I

Economic Operation of Power Systems: Optimal operation of Generators in thermal Power Stations-heat rate curve-cost curve-incremental fuel and production costs-input/output characteristics-optimum generation allocation with line losses neglected-Optimum generation allocation including the effect of transmission line losses-loss coefficients-general transmission line loss formula.

UNIT- II

Modeling of Turbine: first order turbine model-block diagram representation of steam turbines and approximate linear models and modeling of synchronous generator

Modeling of Governor: Mathematical modeling of speed governing system-derivation of small signal transfer function.

Modeling of Excitation System: Fundamental characteristics of an excitation system-transfer function-block diagram representation of IEEE type-1 model.

UNIT – III

Load frequency control: Necessity of keeping frequency constant-definitions of control area-single area control-block diagram representation of an isolated power system-steady state analysis-dynamic response-uncontrolled case.

Proportional plus integral control of single area and its block diagram representation, steady state response-load frequency control and economic dispatch control.

Load frequency control of 2-area system-uncontrolled case and controlled case-tie line bias control

UNIT – IV

Overview of reactive power control-reactive power compensation in transmission systems-advantages and disadvantages of different types of compensation equipment for transmission systems-load compensation-specifications of load compensator-uncompensated and compensated transmission lines-shunt and series compensation.

UNIT – V

Computer Control of Power Systems: Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting

TEXT BOOKS

1. C.L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCES:

1. D. P. Kothari: Modern Power System Analysis - Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis – Tata Mc Graw Hill Pub. Co. 2002.
3. Power System Analysis and Design by J. Duncan Glover and M.S. Sarma., THOMPSON, 3rd Edition
4. Electric Energy systems Theory – by O.I. Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
5. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill
6. Power System Operation and Control – by G. Sreenivasan; S. Sivanagaraju Published by Pearson Education India, 2009

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B. Tech. (EEE) VI SEMESTER

PE3204EE

ELECTRICAL DISTRIBUTION SYSTEM

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

Introduction, Load characteristics. Diversified demand. Non- coincidence demand. Coincidence factor, contribution factor Problems. Rate structure, customer billing, types of distribution transformers.

UNIT-II

Design of Sub-transmission lines and distribution sub-stations. Substation bus schemes, rating of distribution substation, service area with multiple feeders, percent voltage drop Calculations.

UNIT-III

Design considerations of primary systems, radial type, loop type primary feeder, primary feeder loading, uniformly distributed load application to a long line. Design considerations of secondary systems. Secondary banking. Secondary networks. Network transformers, unbalanced loads and voltages.

UNIT-IV

Voltage drop and power loss calculations of 3-phase systems. Voltage fluctuations, measures to reduce flickering. Methods of load flow of Distribution Systems - forward sweep and backward sweep methods.

UNIT-V

Application of capacitors to distribution systems. Effect of series and shunt capacitors, power factor correction, economic justification for capacitors. Best capacitor location-Algorithm. Distribution Automation: Definitions, Components of distribution SCADA.

Suggested Reading

1. Turan Gonen, Electric Power Distribution Engineering, Mc Graw Hill Book Co., International Student Edition. 1986.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing Company Ltd., 1997.

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B. Tech. (EEE) VI SEMESTER

PE3205EE

ELECTRICAL ENERGY CONSERVATION AND AUDITING

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT-II

Basics of Energy and its various forms: Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT-III

Energy Efficiency in Electrical Systems: Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT-IV

Energy Efficient Technologies in Electrical Systems: Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

UNIT-V

Energy Management and Audit: Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Suggested Readings:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online).
3. S. C. Tripathy, *Utilization of Electrical Energy and Conservation*, McGraw Hill, 1991.
4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org).

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B. Tech. (EEE) VI SEMESTER

PE3206EE

HYBRID ELECTRIC VEHICLES

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

Introduction : Basics of vehicles mechanisms, history of electric vehicles (EV) and hybrid electric vehicles (HEV), need and importance of EV and HEV, Power/Energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics. Vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

UNIT II

Drive-Train Topologies: Review of electric traction, various electric drive-train topologies, basics of hybrid traction system, various hybrid drive-train topologies, power flow control in drive-train topologies, fuel efficiency analysis.

UNIT III

Electrical Machines and Power Converters for Hybrid and Electric Vehicles: Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications, AC and DC Motor drives. Permanent magnet and switch reluctance machines, configuration and control of drives. Power Converters- Converters for EV and HEV applications.

UNIT IV

Energy Sources for EV/HEV: Requirements of energy supplies and storage in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, characteristics and comparison of energy sources for EV/HEV, hybridization of different energy sources.

UNIT V

Electric Vehicles Charging Station: Type of Charging station, Selection and Sizing of charging station, Components of charging Station and Single line diagram of charging station. Contactless inductive charging- Stationary Inductive charging, resonant and compensation circuit topologies.

Suggested Readings:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, USA, 2012.
2. Chris Mi, M. Abdul Masrur&David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspective, , Wiley, 2011
3. Iqbal Hussain, Electric & Hybrid Vehicles – Design Fundamentals, 2nd Edition, CRC Press, 2011.
4. SimoraOnori, Hybrid Electric Vehicles Energy Management Strategies, Springer.

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B. Tech. (EEE) VI SEMESTER

PC3208EE

SIGNALS AND LINEAR SYSTEMS

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :30
3	0	0	3	External Marks :70

UNIT-I

Introduction to Signals & Systems: Classification of signals, Operations on signals, types of systems, Exponential and Trigonometric Fourier series, Dirichlet's condition.

UNIT-II

Fourier Transform: Representation of aperiodic signal, Introduction of Fourier transform, Convergence, properties of Fourier Transform, Fourier transform of periodic signals, Singularity function, Parseval's theorem, Energy spectral density, Development of Discrete Time Fourier transform, Convergence issues associated with the DTFT.

UNIT-III

Sampling: Sampling of continuous time signals, sampling theorem, Aliasing effect, reconstruction of a signal and its samples.

Convolution & Correlation of signals: Convolution integral, Properties of convolution, Graphical method of convolution, Convolution of Discrete time signals, overlap-add and overlap-save method of discrete convolution, Definition of correlation, Auto correlation, Properties of Autocorrelation, Cross correlation of signals.

UNIT-IV

Laplace Transform: Review of Laplace transforms, region of convergence and properties, poles and zeros, relation between Laplace and Fourier transforms, properties of Laplace transform, inverse Laplace transform, Solutions to differential equation and system behavior.

UNIT-V

Z Transform: Definition of Z-Transform, Properties of Z-Transform, Region of convergence of Z-Transform, Inverse Z Transform using Inspection, Partial fraction expansion, Power series Expansion, Contour integration methods, Parseval's relation analysis of discrete time systems using Z-Transform. Realization of discrete time system using Direct form, Cascade parallel forms.

Suggested Readings:

1. Alan V. Oppenheim, Alan. S. Willsky, S Hamid Nawab, Signals and Systems, 2nd edition, Prentice Hall of India,2007.
2. Lathi B.P., Signals Systems Communications”, 1st edition, B.S. Publications,2006.
3. Simon Haykin and Van veen, “Signal and system”, Willy, secondedition.

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B. Tech. (EEE) VI SEMESTER
PC3209EE
MICROPROCESSOR SYSTEMS

UNIT – I

Intel 8086 architecture, Segmented memory, Minimum and Maximum modes of operation, timing diagram, addressing modes, Instruction set, Assembler directives, macros, procedures, assembly language programming using data transfer, arithmetic, logical, branching and string manipulation instructions

UNIT – II

8086 Interrupt structure, IO and Memory Interfacing concepts using 8086, IC Chip Peripherals 8255 PPI, 8254 Programmable timer, 8257 DMA controller, 8251 USART .

UNIT – III

8051 Microcontroller – Internal architecture and pin configuration, 8051 addressing modes, instruction set, Bit addressable features. I/O Port structures, assembly language programming using data transfer, arithmetic, logical and branch instructions.

UNIT – IV

8051 Timers/Counters, Serial data communication and its programming, 8051 interrupts, Interrupt vector table, Interrupt programming.

UNIT - V

Real world interfacing of 8051 with external memory, expansion of I/O ports, LCD, ADC, DAC, stepper motor interfacing.

Suggested Readings:

1. Douglas V.Hall, “*Microprocessors and Interfacing Programming and Hardware*”, 2nd Edition, Tata McGraw- Hill publishing company Limited, New Delhi, 1994.
2. Ray A.K & Bhurchandi K.M, “*Advanced Microprocessor and Peripherals*”, 2/e TMH, 2012.
3. Walter A.Triebel and Avatar singh, “*The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware and Applications*”, Prentice-Hall of India Private Limited, New Delhi, 1996.
4. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, “*The 8051 Microcontroller and Embedded Systems using Assembly and C*”, 2nd Edition, Pearson education, 2009.
5. Manish K. Patel, “*The 8051 Microcontroller Based Embedded Systems*”, McGraw Hill, 2014.

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B. Tech. (EEE) V SEMESTER

PC3210EE

MICROPROCESSOR SYSTEMS LAB

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

List of Experiments:

1. Addition, subtraction using 8085
2. Multiplication and division using 8085
3. Simple programs on 8086 kits
4. Searching and sorting using 8086 assembly language
5. String operations like concatenation and swapping using 8086
6. DAC interface to 8086
7. ADC interface to 8086
8. Stepper motor interface to 8086
9. Study of Keil software for 8051
10. Basic programs using 8051 instructions
11. Flashing LED program using 8051
12. Timer program to generate square wave on ports of 8051

Note: At least ten experiments should be conducted in the Semester.

Suggested Readings:

1. Ramesh S.Gaonkar, *“Microprocessor Architecture programming and Applications with the 8085”*, 5th Edition, Penram International publishing (India) private Limited, 1999.
2. Douglas V.Hall, *“Microprocessors and Interfacing programming and Hardware”*, 2nd Edition, Tata McGraw- Hill publishing company Limited, New Delhi, 1994.
3. Muhammad Ali Mazidi, Janice GillispieMazidi and RolinD.McKinlay, *“The 8051 Microcontroller and Embedded Systems using Assembly and C”*, 2nd Edition, Pearson education, 2009.

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B. Tech. (EEE) VI SEMESTER

PC3211EE

LINEAR CONTROL SYSTEMS LAB

Teaching Scheme				Examination Scheme
L	T	P	C	Internal Marks :25
0	0	2	1	External Marks :50

LIST OF EXPERIMENTS

1. Characteristics of D.C. and AC. Servomotor and their transfer function.
2. Characteristics of synchros.
3. Frequency response of second order system.
4. Operating characteristics of Stepper motor.
5. Step response of second order system.
6. D.C. Position control system.
7. A.C. Position control system.
8. Performance of P, PI and PID Controller on system response.
9. Design of lag and lead compensation.
10. ON - OFF temperature control systems.
11. Simulation of control system concepts using MATLAB.
12. PLC (Programmable Logic Controller) applications. (a) Bottle filling (b) Speed control of Stepper motor (c) Liquid level control.
13. Data acquisition system and applications.
14. Industrial process control trainer.

Note: Atleast ten experiments should be conducted in the Semester.

Suggested Reading:

1. Nagrath I.J. &Gopal.M - Control System Engineering, Wiley Eastern, 2003.
2. B.C.Kuo - Automatic Control Systems, Wiley India edition, 7th Edition, 2002.
3. K.Ogata - Modern Control System, Prentice Hall of India, 4th edition, 2002.
4. N.C.Jagan - Control Systems, B.S Publications, 2nd edition,2008.

SUMMER INTERNSHIP

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Electrics/Electronics Industry / R & D Organization / National Laboratory for a period of 6 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department. Also the students have to produce the certificate given by the concern industry before the committee constituted by the department.

One faculty member will co-ordinate the overall activity of Summer Internship.

ANNEXURE

L	:	Lectures
T	:	Tutorials
P	:	Practical's
CIE	:	Continuous Internal Evaluation
SEE	:	Semester End Examination
PC	:	Professional Course
PE	:	Professional Elective
OE	:	Open Elective
HS	:	Humanities& Social Sciences

*Student is required to complete the MOOCS course in electrical and electronics engineering offered by the following agencies. The student is required to take prior approval from the Department, before registering for any course. Unless the student submits a pass certificate, he/she shall not be eligible for the award of degree.

SWAYAM: www.swayam.gov.in , NPTEL: www.onlinecourse.nptel.ac.in