



DEPARTMENT OF ELECTRICAL ENGINEERING

Scheme of Instruction
and
Syllabi of

B.E.(EEE) III & IV Semester

2016



UNIVERSITY COLLEGE OF ENGINEERING
(AUTONOMOUS)



Osmania University
Hyderabad - 500 007 - A.P.

With effect from academic year 2016-2017

**SCHEME OF INSTRUCTION & EXAMINATION
B.E.(EEE) III Semester**

S. No	Course Code	Course Title	Scheme of Instruction			Contact Hrs/wk	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1.	BS901MT	Mathematics - III	3	1	-	4	30	70	3
2.	PC301EE	Electrical Circuits - I	3	1	-	4	30	70	3
3.	PC302EE	Electromagnetic Fields	3	1	-	4	30	70	3
4.	PC303EE	Digital Electronics & Logic Design	3	1	-	4	30	70	3
5.	ES323EC	Electronic Engineering-II	3	-	-	3	30	70	3
6.	ES322ME	Prime Movers & Pumps	3	-	-	3	30	70	3
7.	HS901BT	Environmental Sciences	3	-	-	3	30	70	3
Practicals									
8.	ES343EC	Electronic Engineering Lab.	-	-	2	2	25	50	1
9.	PC351EE	Computer Aided Electrical Drawing Lab.	-	-	2	2	25	50	1
			21	4	4	30	260	590	23

with effect from the academic year 2016-2017

**Interdisciplinary Courses Offered to Other Departments
B.E III Semester**

S. No.	Course Code	Course Title	Scheme of Instruction			Contact Hrs/wk	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1.	ES321EE	Electrical Technology (For CE)	2	-	-	2	15	35	2
2.	ES322EE	Electrical Circuits & Machines (For ME)	3	-	-	3	30	70	3
3.	ES341EE	Electrical Engineering Lab (For ECE & CSE)	-	-	2	2	25	50	1

BS901MT

MATHEMATICS-III

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

- 0) To introduce the concept of functions of complex variables and their properties
- 1) To formulate partial differential equations and to introduce a few methods to solve first order linear and non-linear partial differential equations
- 2) To study Fourier series and its applications to partial differential equations

Outcomes:

At the end of the course students will be able to

- 1) determine the analyticity of a complex functions and expand functions as Taylor and Laurent series
- 2) evaluate complex and real integrals using residue theorem
- 3) expand function as a Fourier series
- 4) find solutions of first order and second order partial differential equations

UNIT-I

Functions of Complex Variables: Limits and continuity of function, differentiability and analyticity, necessary & sufficient conditions for a function to be analytic, Cauchy-Reimann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's formula for derivatives and their applications.

UNIT-II

Residue Calculus:

Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, bilinear transformation, conformal mapping.

UNIT-III

Fourier series:

Fourier series, Fourier series expansions of even and odd functions, convergence of Fourier series, Fourier half range series.

UNIT-IV

Partial differential equations:

Formation of first and second order partial differential equations, solution of first order equations, Lagrange's equation, Nonlinear first order equations, Charpit's method, higher order linear equations with constant coefficients.

UNIT-V

Fourier series applications to partial differential equations:

Classification of linear second order partial differential equations, separation of variables method

(Fourier method), Fourier series solution of one dimensional heat and wave equations, Laplace's equation.

Suggested Reading:

1. R.K.Jain, S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publication , 4th Edition, 2014.
2. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications , 43rd Edition, 2014.
3. Gupta, Kapoor, *Fundamentals of Mathematical statistics*, Sultan chand & sons, New Delhi, 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics* , 9th Edition, 2012.
5. James Brown, Ruel Churchill, *Complex variables and Applications* , 9th Edition, 2013.

With effect from the academic year 2016 - 2017

PC301EE

ELECTRICAL CIRCUITS - I

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To acquire knowledge in circuits and to understand the fundamentals of derived circuit laws.
2. To understand theorems, steady state and transient analysis of single phase and 3-phase circuits.

Course outcomes:

At the end of the course the students will be able to

- 1) understand network analysis, techniques using mesh and node analysis.
- 2) evaluate steady state and transient behavior of single port network for DC and AC excitations.
- 3) analyze electric circuits using network theorems.
- 4) understand the concept of coupled circuits and poly-phase circuits.

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, Millman'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 integrodifferential 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.

PC302EE

ELECTROMAGNETIC FIELDS

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To be able to understand the concepts of electrostatic fields, magneto static fields, electromagnetic waves and Maxwell's equation.
2. To understand the concepts of electromagnetic wave propagation in different media.

Outcomes:

At the end of the course students will be able to

1. Formulate problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media.
2. Derive expressions for the energy for electrostatic and magnetostatic fields, and derive Poyntings theorem.
3. Calculate the boundary conditions for electric and magnetic fields between different media.
4. Calculate the reflection and refraction coefficients of electromagnetic waves for different conditions.

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.

With effect from the academic year 2016 – 2017

PC303EE

DIGITAL ELECTRONICS & LOGIC DESIGN

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To be able to understand the principles of digital systems and binary arithmetic circuits.
2. To study the properties and realization of various logic gates, A/D and D/A converters.

Outcomes:

At the end of the course the students will be able to

1. differentiate the number system, convert and compare a number system to another number systems used in digital logic design.
2. understand Boolean algebra and its application to DeMorgan's theorems and karnaugh map reduction method.
3. analyze and design various digital combinational circuits

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, 1991

With effect from the academic year 2016 - 2017

ES323EC

ELECTRONIC ENGINEERING – II

Instruction
Duration of SEE
SEE
CIE
Credits

3 hours per week
3 Hours
70 Marks
30 Marks
3

Objectives:

- To understand the concept of feedback amplifiers and Oscillators
- To understand the design concepts of active filters
- To study the concepts of power amplifiers and wave shaping circuits

Outcomes:

- Ability to design feedback amplifiers ckt with its applications.
- Ability to analyze and design various oscillators.
- Ability to design power amplifier for various applications.
- Ability to design various filters required.
- Ability to design clipping and clamping circuits and various multi-vibrators.

Unit I

Feedback Amplifiers: Concept of Feedback, Feedback Amplifier Configurations, Circuits, Advantages of Negative feedback, Analysis of Simple feedback amplifiers using BJT and FET.

Unit II

Oscillators: Barkhausen Criterion, RC Oscillators: Wien Bridge, Phase shift, LC Oscillators: Hartley and Colpitt's Oscillators, Crystal Controlled Oscillators (analysis of oscillators using BJTs only), stability of oscillators, Non-Sinusoidal oscillators (using Op-Amps)

Unit III

Butterworth Filters: Active Low pass filter, High Pass Filter, Band Pass Filter, Notch Filter, Design of Second, fourth and sixth order Filters using Op-Amps.

Unit IV

Carrier Amplifier: Chopper Amplifier, Principles and Applications. Phase sensitive Detector. Classification of Power Amplifiers, Analysis of Class A and Class B Power amplifiers: Distortion in Amplifiers, Push-Pull Amplifiers, Complementary Symmetry, IC Power Amplifiers.

Unit V

Wave Shaping Circuits: RC Low pass and High pass circuits, Response to Step, Pulse, Ramp and Square wave inputs, Differentiator and Integrator, Clipping circuits for single level and two level, clamping circuits and applications. Multivibrator circuits: Astable, Monostable and Bistable circuits using Op-Amp and 555 Timer, Schmitt Trigger circuit.

Suggested Reading:

- 1 Millman Jacob, Taub Herbert, Prakash Rao M , *Pulse, Digital and Switching waveforms*, 3rd Edition, Tata McGraw-Hill, 2007.
- 2 Millman J, Halkias C.C, Satyabrata Jit, *Electronic Devices and Circuits*, 3rd edition, Tata McGraw-Hill, 2011.
- 3 Millman J., Halkias C.C, Parikh C, *Integrated Electronics*, 2nd edition, Tata McGraw-Hill, 2011.

ES322ME

PRIME MOVERS AND PUMPS

Instruction	3 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives

1. To acquire knowledge of fluid mechanics and governing equations
2. To understand the working principle of hydraulic turbines and pumps
3. To understand the working principle of steam and gas power plants
4. To be able to estimate the power developed in the engine, turbines
5. To familiarize the concepts of increasing the efficiency of turbines.

Outcomes

After completing the course the student will have:

1. Knowledge regarding various theories dealing with the flow phenomenon of fluid
2. Ability to define the nature of a fluid, viscosity effects on flow and characteristics of Newtonian and non-Newtonian fluids.
3. Understanding of basics of the hydraulic, steam and gas turbines, and their components, functions and applications
4. Knowledge of different types of boilers, turbines and pumps.
5. Recognize typical designs of turbines and pumps

UNIT-I

Fluid Mechanics: Properties of fluids, Newtonian and Non-Newtonian fluids. Continuity, Momentum and Energy equations. Bernoulli's equation and its applications. Laminar and Turbulent flows. Basic concepts of Boundary layer theory and boundary layer thickness.

UNIT-II

Hydraulic Turbines: Layout of Hydroelectric power plant. Working principle of Pelton, Francis and Kaplan turbines. Draft tube in Reaction turbine. Velocity diagrams for impulse and Reaction turbines. Blade angles and dimensions for Reaction turbines. Work done, power output and efficiencies. Simple problems on Pelton, Francis and Kaplan turbines. Selection of turbines for electric power generation. Specific speed and its ranges for Pelton, Francis and Kaplan turbines. Unit quantities. Performance and characteristic curves. Cavitation and its effects.

UNIT-III

Pumps: Reciprocating Pumps-Working of single and double acting types. Functions and use of Air vessels. Problems on pressure head, work done, power required without and with air vessels. **Centrifugal pumps:** Parts and working of CF pumps. Need for priming, pump installation. Velocity diagrams and vane angles. Types of Impellers. Work and power required. Manometric and other efficiencies. Simple problems for single stage pumps; Principles of similarity, specific speed and unit quantities. Performance and characteristic curves.

UNIT-IV

Basic Steam Engineering: Generation, properties and dryness fraction of steam. Functions of a boiler. Working of a simple vertical type and Babcock and Wilcox type boilers with simple sketches. Boiler Mountings and Accessories and their functions. Rankine cycle, Re-heat and Re-generation cycles.

UNIT -V

Steam and Gas Power Plants: Layout of simple steam power plant and working of its individual units. Classification and compounding of steam turbines. Velocity diagrams for single stage impulse and reaction turbines. Simple problems on work done, blade angles, power output and thermal efficiencies of turbines. Working of reheat and bleeding cycles. **Gas Turbine Power Plant:** Brayton cycle for gas turbines. Simple closed cycle and open cycle gas turbine plants. Layout and efficiency of gas turbine plants. Intercooling and Reheating cycles. Evaluation of power output, cycle temperatures and thermal efficiencies for simple gas turbine plants.

Suggested Reading:

1. Ballaney P. L, "*Thermal Engineering*", Khanna Publishers, 19th Edn., 1993.
2. Yadav R, "*Steam and Gas turbines*", Galgotia Publishers, 6th Edn., 1992.
3. Rajput., "*Thermal Engineering*", Laxmi Publications (P) Ltd, New Delhi.
4. Bansal R.K., "*Fluid Mechanics and Hydraulic Machines*", Laxmi Publications(P) ltd, New Delhi.
5. Kumar D.S, "*Fluid Mechanics and Fluid Power Engineering*", S.K. Kataria & Sons, 6th Edn., 2003.

HS901BT

ENVIRONMENTAL SCIENCES

Instructions	3 Hrs/ Week
Duration of SEE	3 Hrs
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

- To study the basic concepts, sources of water, floods and their impact on environment
- To know the ecosystems and energy resources systems
- To understand the Biodiversity concepts and their advantages
- To study the different pollutions and their impact on environment
- To know the social and environment related issues and their preventive measures

UNIT-I

Environmental Studies: Definition, scope and importance, need for public awareness.

Natural resources: Water resources; use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams:benefits and problems. Effects of modern agriculture, fertilizer- pesticide problems, water logging and salinity.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

Energy resources: Growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT-III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution; solid and liquid waste management.

Environment Protection Act: Air, water, forest and wild life Acts, enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle, and disaster management in India.

Suggested Reading:

1. A.K. De "*Environmental Chemistry*", Wiley Eastern Ltd.
2. E.P. Odum "*Fundamentals of Ecology*", W.B. Saunders Co., USA.
3. M.N. Rao and A.K. Datta "*Waste Water Treatment*", Oxford and IBK Publications.
4. Benny Joseph "*Environmental Studies*", Tata McGraw Hill, 2005.
5. V.K. Sharma "*Disaster Management*", National Centre for Disaster Management, IPE, Delhi, 1999.
6. "*Green Building Council of India*", Teri Document.

ES343EC

ELECTRONIC ENGINEERING LAB

Instruction	2 Hours/ week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Objectives:

1. To understand the diode characteristics.
2. To study the input and out characteristics of different Transistor configurations
3. To understand the design concepts of amplifier
4. To understand the design concepts of Combinational and Sequential circuits
5. To understand the design concepts of OP-Amp

List of Experiments:

1. Study and Use of different meters for the measurement of Electrical Parameters and CRO
2. Measurement of R,L & C, Using L C R Meter, Color Code Method and Soldering Practice
3. Characteristics of Semiconductor Diodes(Si, Ge and Zener)
4. Characteristics of BJT(CB,CE)
5. Rectifiers: Half Wave Rectifier, Full Wave Rectifier with and without series and Shunt Regulators
6. CRO and its Applications
7. Characteristics of FET
8. Transistors as an Amplifier
9. Inverting, Non-Inverting and Differential Amplifier using Op amp.
10. Realization of Logic Gates Using Diode transistor Logic
11. Half Adder and Full Adder Circuits
12. Integration and Differentiation using Op amp
13. Transistor and FET Biasing.

Suggested Reading:

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

PC351EE

COMPUTER AIDED ELECTRICAL DRAWING LAB.

Instruction	2 Hours/ week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Objectives :

1. To understand the terminology of electric circuit and electrical components.
2. To be able to familiarize with electrical machines, apparatus and appliances.
3. To acquire knowledge on various Electrical Engg. software's.

Outcomes:

At the end of the course students will be able to

1. Identify and draw different components of electrical systems
2. Draw different control and wiring diagrams
3. Draw winding diagrams of electrical machines.

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, 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

Text Books:

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

ES321EE

ELECTRICAL AND MECHANICAL TECHNOLOGY

**SECTION A: ELECTRICAL TECHNOLOGY
(For Civil Engg.)**

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	2

Objectives :

1. To acquire knowledge in electrical circuits.
2. To be able to understand the basic principle operation of electrical machines.

Outcomes:

1. Students will know the basics of Electrical Engineering with good knowledge on underlying principles of operation
2. Students can relate these basics with daily experiences

UNIT I

DC Circuits: Ohm's law, Kirchoff's laws, Resistance networks, Series, Parallel and Series-parallel circuits, Power loss in resistive elements.

AC Circuits: Principles of production of ac waveform, frequency, effective value and form factor, Phasor representation, Behaviour of pure resistance, inductance, and capacitance with ac sinusoidal source, Impedance and simple ac networks with R, L and C elements.

UNIT II

Three Phase Circuits: Star and Delta connections under balanced conditions, Line & phase Voltages and currents and three phase power.

Working principle of single phase energy meter.

Basic principles of DC generator and motor

UNIT III

Transformers: Principle and working of single phase transformer under no-load and load conditions, O.C & S.C tests, Losses & efficiency, voltage regulation.

Three phase Induction Motors: Rotating magnetic field, Torque-slip characteristics, Starting methods – DOL starter, Star/Delta starter.

Basic idea and applications of single phase induction motors – Capacitor start 1-phase induction motor.

Suggested Reading:

1. Mehta V.K., *Principles of Electrical Engineering and Electronics*, S.Chand & Co., 1999
2. John Bird, *Electrical Circuit theory and Technology*, Routledge Taylor & Francis Group, Fourth Edition, 2012.
3. Naidu M.S, Kamakshiah S., *Introduction to Electrical Engineering*, Tata McGraw Hill, 1995.
4. A.Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "*Basic Electrical Engineering*" Tata McGraw Hill Education PVT LTD, 2009.

ES322EE

ELECTRICAL CIRCUITS AND MACHINES
(For Mech. Engg.)

Instruction	3 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To acquire knowledge in electrical circuits.
2. To be able to understand the basic principle operation and performance of electrical machines.

Outcomes:

1. Students will know the basics of Electrical Engineering with good knowledge on underlying principles of operation.
2. Students can relate these basics with daily experiences.

UNIT I

DC Circuits: Ohm's law, Network elements, Kichhoff's laws, Power in DC circuits, Series & parallel resistances, Thevinin's and Norton's theorems.

AC Circuits: Sinusoidal sources, Phasor representation of sinusoidal quantities, Average and RMS values, Form factor, Analysis of RLC circuits to sinusoidal inputs, Power factor, Active & reactive powers, energy stored in inductance and capacitance, Mutual inductance.

UNIT II

Three-Phase Circuits: Production of 3-phase voltages, balanced star and delta connections, Measurement of power by Two-wattmeter method.

Single Phase Transformers: Principle of operation, Transformer on No-load and Load, Equivalent circuit, Efficiency & regulation, O.C and S.C tests, Principle of autotransformer.

UNIT III

DC Machines: Construction and working principle of generator and motor, EMF in generator, Types of excitation, Characteristics of series and shunt generators, Applications, Torque in a DC motor, Characteristics of shunt and series motors, Speed control of dc shunt motors, Losses & efficiency, Three point starter.

UNIT IV

Three-Phase Induction Motors: Production of rotating magnetic field, Construction and principle of Induction motors, Torque-slip characteristics, Star delta and Autotransformer starters, Speed control by Stator voltage and Rotor resistance methods.

UNIT V

Single-Phase Motors: Capacitor start and Capacitor run motor, Universal motors.

Three - Phase alternators: Construction, emf equation, Regulation by synchronous impedance method.

Suggested Reading:

1. Naidu M.S, Kamakshiah S, *Introduction to Electrical Engineering*, Tata McGraw Hill, 1995
2. John Bird, *Electrical Circuit theory and Technology*, Routledge Taylor & Francis Group, Fourth Edition, 2012.
3. Mehta V.K., *Principles of Electrical Engineering and Electronics*, S.Chand & Co., 1995
4. A.Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, *Basic Electrical Engineering*, Tata McGraw Hill Education PVT LTD, 2009.

With effect from the academic year 2016 – 2017

ES341EE

**ELECTRICAL ENGINEERING LAB
(Common for ECE & CSE)**

Instruction	2 Hours/ week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Objectives :

1. To learn practical electric AC & DC circuits.
2. To learn operation and performance characteristics of electrical machines by conducting various tests practically.

Outcomes :

1. Awareness about various electric safety rules to be followed while working with electrical equipments
2. Explore themselves in designing basic electric circuits
3. Identify requirements for electric machines for domestic and industrial purpose

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevenin's and Norton's Theorems.
3. Study of Three-Phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of Shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Tests on Single-Phase Transformer.
11. Load Test on Single-Phase Transformer.
12. Load Test on Three-Phase Induction Motor.

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

With effect from academic year 2016-2017

**SCHEME OF INSTRUCTION & EXAMINATION
B.E.(EEE) IV Semester**

S. No	Course Code	Course Title	Scheme of Instruction			Contact Hrs/wk	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1.	BS902MT	Mathematics - IV	3	1	-	4	30	70	3
2.	PC401EE	Electrical Circuits - II	3	1	-	4	30	70	3
3.	PC402EE	Electrical Machines-I	3	1	-	4	30	70	3
4.	PC403EE	Power System-I	3	1	-	4	30	70	3
5.	PC404EE	Electrical Measurements & Instrumentation	3	1	-	4	30	70	3
6.	PC405EE	Linear Integrated Circuits	3	-	-	3	30	70	3
7.	HS901MB	Managerial Economics & Accountancy	3	-	-	3	30	70	3
Practicals									
8.	PC451EE	Electrical Circuits Lab	-	-	2	2	25	50	1
9.	ES441ME	Prime Movers & Pumps Lab	-	-	2	2	25	50	1
			21	05	04	30	260	590	23

**Interdisciplinary Courses Offered to Other Departments
B.E. IV Semester**

S. No	Course Code	Course Title	Scheme of Instruction			Contact Hrs/wk	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
1.	ES441EE	Electrical Circuits & Machines Lab (For ME)		-	2	2	25	50	1

BS902MT

MATHEMATICS-IV

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

- 0) To introduce transforms like Laplace, Fourier , Z-transforms and their properties
- 1) To introduce a few numerical methods to solve certain types of problems
- 2) To understand curve fitting, correlation and regression

Out comes:

At the end of the course students will be able to

1. solve differential equations using Laplace and Fourier transforms
2. solve difference equation using Z-transforms
3. find numerical solution of algebraic, transcendental equations and ordinary differential equations.
4. perform a regression analysis and to compute and interpret the coefficient of correlation

UNIT- I

Laplace transforms: Introduction of Laplace transforms, sufficient condition for existence of Laplace transform, Laplace transform of Derivatives, Laplace transform of integrals, Translation theorems (I & II shifting theorems), Differentiation of Laplace transform (Multiplication by t), Integration of Laplace transform(Division by t), convolution theorem, Solving initial value problems using Laplace transform.

UNIT- II

Fourier transforms: Introduction, Fourier integrals, Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier sine and cosine transforms, Finite Fourier sine and cosine transforms, Properties of Fourier transforms, Convolution theorem for Fourier transforms.

UNIT- III

Z-Transforms: Introduction, basic theory of Z-transforms, Z-transforms of standard sequences, existence of Z-transform, linearity property, translation theorem, scaling property, initial and final value theorems, differentiation of Z-transform, convolution theorem, solution of difference equations using Z-transforms.

UNIT- IV

Numerical methods: Solution of Algebraic and Transcendental equations: Bisection method, Newton-Raphson method, Solution of linear system of equations: Gauss

elimination method, Gauss- Seidel iteration method, Interpolation: Lagrange's interpolation, Newton's divided difference interpolation, Newton's Forward and Backward difference interpolations, Numerical differentiation, Numerical solutions of ordinary differential equations : Taylor's series method, Euler method, Runge-Kutta method of 4th order.

UNIT- V

Curve fitting:

Curve fitting by method of least squares, correlation and regression, types of correlations, Karl Pearson's coefficient of correlation, Spearman's rank correlation coefficient, equal ranks, equations to the lines of regression.

Suggested Reading:

1. R.K.Jain, S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publication, 4th Edition, 2014.
2. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
3. Vasishtha, Gupta, *Integral Transforms*, Krishnan Prakashan Publications, 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, 2012.

With effect from the academic year 2016 - 2017

PC401EE

ELECTRICAL CIRCUITS - II

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To acquire knowledge in circuits and to understand the Fourier series and Laplace transformation.
2. To be able to understand the techniques of electric network synthesis.

Outcomes:

At the end of the course the students will be able to

- 1) Examine the behavior of linear circuits using Fourier transform, Laplace transforms and transfer function of single port network.
- 2) Obtain two port network parameters and applications of graph theory to electric circuits.
- 3) Synthesize a network in terms of RL, RC and RLC parameters.

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 zeros.

Suggested Reading:

1. Van Valkenburg M.E, *Network Analysis*, Prentice Hall of India, 3rd Edition, 2000.

2. William Hayt H, Kimmerly Jack E. and 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.
4. Chakravarthy A., *Circuit Theory*, Dhanpat Rai & Co., First Edition, 1999

With effect from the academic year 2016 - 2017

PC402EE

ELECTRICAL MACHINERY - I

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To learn and understand electromechanical energy conversion devices.
2. To be able to understand in detail about DC machines. Construction, principle, performance characteristics and testing.

Outcomes:

At the end of the course the students will be able to

1. understand construction, operating principle and characteristics of different types of DC motors and generators
2. test and calculate performance parameters of DC motors and generators
3. select appropriate DC machines for a specific application

UNIT I

Electromechanical energy conversion : Principle of energy conversion, Flow of energy in electromechanical 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. AE Clayton and NN Hancock, *The Performance and Design of Direct Current Machines*, 3rd edition, 1959.

With effect from the academic year 2016 - 2017

PC403EE

POWER SYSTEM - I

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To be able to learn and understand the conventional and renewable generating power stations and economics of generation.
2. To be able to understand design concepts of transmission lines and cables .

Outcomes:

1. The students will acquire knowledge in conventional renewable generating power stations and economics of generation
2. The students will acquire knowledge regarding the design concepts of transmission lines and cables.

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.

Suggested Reading:

1. Wadhwa C.L., *Electrical Power Systems*, New Age International (P) Ltd., 4th Edition, 2007.
2. Wadhwa C.L., *Generation, Distribution and Utilization of Electrical Energy*, New Age International (P) Ltd., 4th Edition, 2006.
3. Singh S.N., *Electrical Power Generation, Transmission and Distribution*, Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.
4. V.K.Mehta, *Principles of Power Systems* , S. Chand and Co., 2007.

With effect from the academic year 2016 - 2017

PC404EE

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Instruction	4 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To learn and understand the fundamental concepts, principle of operation and applications of various electrical measuring instruments.
2. To understand various types of Bridges in measurement of resistance, inductance, capacitance and frequency.
3. To understand the operation and applications of Ballistic Galvanometer, Flux meter and DC/AC Potentiometer.
4. To understand the application of CRO for measurement of Amplitude , Phase and frequency of sinusoidal signals.

Outcomes:

At the end of the course the students will be able to

1. Choose the suitable instrument like Ammeter, Voltmeter for AC/DC applications.
2. Select suitable Bridge for measurement of electrical parameters and quantities.
3. Use CRO for measurement of Amplitude , Phase and frequency of sinusoidal signals.

UNIT I

Instruments: indicating, Recording and Integrating instruments, Ammeter, Voltmeter, Expression for torque of moving coil, moving iron, Dynamometer, induction and electrostatic instruments .Extension of range of instruments, Wattmeter Torque expression for dynamometer instruments, Reactive power measurement.

UNIT II

Meters: Energy meters, single phase and 3-phase, Driving torque and braking torque equations, Errors and testing compensation, Maximum demand indicator, Power factor meters, Frequency meters, Electrical resonance and Weston type of synchroscope.

UNIT III

Bridge Methods and transducers: Measurement of inductance, capacitance and resistance using Bridges, Maxwell's, Hay's. bridge, Anderson, Wein, Desauty's, Schering's bridges, Kelvin's double bridge, Megger, Loss of charge method, Wagners earthing device, Transducers - Analog and digital transducers, Strain gauges and Hall effect transducers.

UNIT IV

Magnetic Measurements and instrument transformers: Ballistic galvanometer, Calibration by Hibbert' s magnetic standard flux meter, Lloyd-Fischer square for measuring iron loss, Determination of B-H curve and Hysteresis loop using CRO, Instrument transformers – Current and potential transformers, ratio and phase angle errors of CT's and PT's.

UNIT V

Potentiometers: Crompton's DC and AC polar and coordinate types, Applications, Measurements of impedance, Calibration and ammeter voltmeter and wattmeters. Use of oscilloscope in frequency, phase and amplitude measurements

Suggested Reading:

1. Shawney A.K., *Electrical and Electronics Measurements and Instruments*, Dhanpatrai & Sons, Delhi, 2000.
2. Umesh Sinha, *Electrical, Electronics Measurement & Instrumentations*, Satya Prakashan, New Delhi.
3. Golding E.W., *Electrical Measurements & Measuring Instruments*, Sir Issac & Pitman & Sons Ltd., London.
4. U.A.Bakshi, A.V.Bakshi, *Electrical and Electronic Instrumentation*, Technical publications

with effect from the academic year 2016 – 2017

PC405EE

LINEAR INTEGRATED CIRCUITS

Instruction	3 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives :

1. To familiarize and able to understand Op-amps.
2. To understand the different linear and non-linear applications of op-amp
3. To understand the voltage regulators and active filters by using op-amps.

Outcomes:

1. Students will be able to design and use op-amps for various linear and non-linear applications.
2. Ability to design and use voltage regulators and active filters

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 damper, 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.

With effect from the academic year 2016-2017

HS901MB

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Instruction	3 hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives:

- To learn important concepts of Managerial Economics and apply them to evaluate business decisions.
- To understand various parameters that determine the consumers' behavior.
- To evaluate the factors that affect production.
- To understand the concepts of capital budgeting and payback period.
- To study the concepts of various book-keeping methods.

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. (Theory questions and small numerical problem can be asked)

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 (theory and problems can be asked)

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. (Theory questions and numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked)

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.

(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some 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

PC451EE

ELECTRICAL CIRCUITS LAB.

Instruction	2 Hours per week
Duration of SEE	2 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	1

Objectives :

1. To Train the Students for acquiring practical knowledge in time response and frequency response of series / parallel RC, RL and RLC Circuits.
2. To prepare the students for finds out parameters of a given two port network.
3. To make the students for understanding the verification of theorems.
- 4.

Outcomes:

At the end of the course the student will be able to.

1. Evaluate the time response and frequency response characteristics of R,L,C Series and parallel circuits.
2. Able to validate the network theorems.
3. Able to find various parameters of a two-port network.
4. Able to simulate electrical circuits using spice.
5. Able to synthesize networks from a given transfer function

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.

ES441ME

PRIME MOVERS AND PUMPS LAB

Instruction	2 Hours per week
Duration of SEE	2 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	1

Objectives:

1. To gain knowledge of working of petrol and diesel engines
2. To be able to estimate the power developed in the engine
3. To understand the working principle of hydraulic turbines and pumps
4. To understand the performance of turbines using characteristic curves
5. To gain the knowledge of various flow meters and the concept of fluid mechanics

Outcomes:

6. Knowledge regarding components and functioning of engines
7. Ability to calculate the power developed, losses in the engines
8. Understanding of viscosity of oils
9. Knowledge of flash and fire point of oils, and its importance
10. Knowledge of estimating the power of turbines and pumps

a) Thermal Engineering Laboratory:

1. Flash and Fire point test.
2. Performance test on diesel engine
3. Valve timing diagram test on a I.C engine
4. Morse test on multi-cylinder petrol engine.
5. Heat balance test on diesel engine.
6. Performance test on VCR engine

b) Hydraulic Machinery Laboratory:

7. Performance test on Pelton wheel turbine.
8. Characteristics curves test on Pelton wheel turbine.
9. Performance test on Francis turbine.
10. Characteristics curves test on Francis turbine.
11. Performance test on Turgo wheel.
12. Characteristics curves test on Turgo wheel.
13. Performance test on Reciprocating pump.

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

With effect from the academic year 2016 – 2017

EE 441EE

ELECTRICAL CIRCUITS & MACHINES LAB
(For Mech. Engg.)

Instruction	2 Hours per week
Duration of SEE	2 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	1

Objectives :

1. To learn practical electric AC & DC circuits.
2. To learn operation and performance characteristics of electrical machines by conducting various tests practically.

Outcomes :

1. Aware of various electric safety rules to be followed while working with electric circuits and equipments
2. Explore themselves in designing basic electric circuits
3. Identify requirements for electric machines for domestic and industrial purpose

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Thevenin's and Norton's Theorems.
3. Study of Three-Phase Balanced Circuits.
4. Measurement of Power by Two-Wattmeter Method.
5. Study of Single-Phase RLC Series Circuits.
6. Magnetization Curve of a Separately Excited DC Generator.
7. Load Characteristics of Shunt Generator.
8. Performance Characteristics of Shunt Motor.
9. Speed Control of DC Shunt Motor.
10. O.C and S.C Tests on Single-Phase Transformer.
11. Load Test on Single-Phase Transformer.
12. Load Test on Three-Phase Induction Motor.

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