NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Teacher, Paper Setter & Examiner

Manual

for

Second Year Electrical Engineering

Faculty of Engineering and Technology

SEMESTER – III and IV

W.E.F 2013 – 2014

Engineering Mathematics-III

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of linear differential equations:

Liner differential equation		**Lectures required**	**Reference No**
a	Solution of LDE of order n with constant coefficients	02	1,3,6
b	Method of variation of parameters (Only Second Order)	02	1,3,6
c	Cauchy's linear equation.	02	1,3,6
d	Legendre's linear equation.	02	1,3,6
e	Applications of Linear differential equations to electrical circuits.	01	1,3,6
Guidelines for the examiner and paper setter. 1) No question should be asked on introductory part			

Unit – II

Teacher should facilitate learning of Function of Complex Variable

Function of Complex Variable		**Lectures required**	**Reference No**
b	Analytic Functions, Cauchy-Riemann equations.	03	1,6
c	Cauchy's Integral theorem and Cauchy's Integral Formula (without proof).	02	1,6
d	Cauchy's Residue theorem (Without proof)	02	1,6
e	Conformal mapping, Bilinear transformations.	02	1,6
Guidelines for the examiner and paper setter. 1. No theoretical questions from analytical function or C-R equation should be asked. 2. Questions from conformal mapping restricted to bilinear transformation only should be asked.			

UNIT III

Teacher should facilitate learning of Laplace Transform.

Laplace Transform		**Lectures required**	**Reference No**
a	Definition and Existence of Laplace transforms.	01	1,3,5,6
b	Laplace Transform of elementary/standard functions.	02	1,3,5,6
c	LT of some special Functions viz., error, Periodic, Unit step, unit Impulse.	01	1,3,5,6
d	Theorems & Properties of Laplace Transform (without proof).	01	1,3,5,6
e	Inverse Laplace Transform.	01	1,3,5,6
f	Applications of LT for Network Analysis	01	1,3,5,6
g	Applications of LT to solution of linear differential equation.	01	1,3,5,6
Guidelines for the examiner and paper setter. 1) Questions from application of LT to solution of linear differential equation should be restricted to second order.			

Unit – IV

Teacher should facilitate learning of Fourier Transform and Z-Transform.

Fourier Transform and Z-Transform		**Lectures required**	**Reference No**
a	**Fourier Transform**: Introduction to Fourier Integral theorem.	01	2,4,6
b	Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse	03	2,4,6
c	**Z-Transform**: Definition and standard properties (without proof)	01	2,4,6
d	Region of Convergence.	01	2,4,6
e	Z-Transform of standard /elementary sequences.	01	2,4,6
f	Inverse Z-transform.	01	2,4,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part.			

Unit – V

Teacher should facilitate learning of Vector Calculus and its applications

Vector Calculus and its applications		**Lectures required**	**Reference No**
a	Introduction to Gradient, Divergence, Curl, Solenoid and Irrotational vector fields.	02	1,6
b	Vector integration: Line Integral, Surface and Volume integrals.	02	1,6
c	Gauss's Stokes and Green's Theorems (without proof).	02	1,6
d	Applications to Maxwell's equation.	02	1,6
Guidelines for the examiner and paper setter. 1. No theoretical questions should be asked.			

Reference Books:

1. H.K. Dass , "Advanced Engineering Mathematics", S. Chand Publication, New Delhi.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
3. B.S. Grewal , "Higher Engineering Mathematics", Khanna Publication, Delhi
4. Wylie C.R. & Barrett , "Advanced Engineering Mathematics", Mc Graw Hill
5. B.V. Raman, "Engineering Mathematics", Tata Mc- Graw – Hill.
6. N. P. Bali, "A Text Book of Engineering Mathematics", Laxmi Publication
7. http://nptel.iitm.ac.in

Power Plant Engineering

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning about the different types of fuels, basic thermodynamics of different power plant cycles.

		Lectures required	**References**
a	Introduction to different types of fuels , classification of fuels	1	1,2,3
b	Combustion , excess air.(No numerical treatment on combustion of fuels)	2	1
c	Thermodynamic Cycles of steam flow	2	1,2
d	Rankine Cycle, Reheat cycle	2	1,2
e	Regenerative cycle(numerical based on above Cycles) gas power cycles	1	1,2
f	Pulverized coal firing systems, fluidized bed combustion	1	1,2,3
Guidelines for the examiner and paper setter. 1)No numerical treatment on combustion of fuels 2)Numerical based on power plant Cycles			

Unit - II

Teacher should facilitate learning of Power plant engineering, construction working principle of Power plant Equipments

	Unit-II	**Lectures required**	**References**
a	Types of boilers and boilers mountings and accessories	2	1,2
b	Heat balance sheet for boiler plant (numerical) layout of thermal power plant	2	1,2
c	Site selection of thermal power plant	1	1,2
d	Requirement of electric power station design.	1	1,2
e	Selection of turbine generator set, coal handling	1	1,2
f	Storage , preparation and feeding ,out plant handling, storage of coal at plant	1	1,2
g	Implant handling, coal crushing	1	1,2
Guidelines for the examiner and paper setter. 1) Numerical should be based on heat balance sheet for Boilers.			

Unit - III

Teacher should facilitate learning of basics of hydro electric power plant ,study of various water turbines. & their performance

	Unit-III	**Lectures required**	**References**
a	Introduction , classification of hydro electric plant	1	1,2,3
b	Selection of site for hydroelectric plant	1	1,2,3
c	Estimation of power available	1	1,2,3
d	Hydrolic turbine, pelton wheel, francis and Kaplan turbine	1	1,2,3
e	Performance of water turbines (numerical) cavitation in water turbines	1	1,2,3
f	Draft types ,selection of hydraulic turbines	1	1,2,3
	Governing of turbines, safety measures in hydro station	1	1,2,3
Guidelines for the examiner and paper setter. 1) Numerical should be based on performance of water turbine.			

Unit - IV

Teacher should facilitate learning of basics of nuclear energy, study of various types of nuclear reactor & introduction regarding diesel power plant.

	Unit-IV	**Lecture required**	**References**
a	Introduction , plant siting , basic principles of nuclear Energy	1	1,2,3
b	Energy mass relationship, structure of the atom , radio active decay, mass defect and binding energy	2	4,5,6
c	Nuclear Chain reaction, main parts of Nuclear reactor and control , classification	2	4,5,6
d	Basic reactor system, Radioactive waste disposal ,safety features	2	4,5,6
e	Diesel power plant:- Introduction, site selection ,main components and its working , Diesel plant Efficiency, choice and characteristic of Diesel power plant.	2	4,5,6
Guidelines for the examiner and paper setter. 1)No numerical treatment			

Unit - V

Teacher should facilitate learning cost estimation for power plant & different techniques of measurement of various parameters & their control.

	Unit - V	**Lectures required**	**References**
a	Introduction ,cost analysis, Estimation and predication of load	1	4,5,6
b	Some commonly used terms, factors affecting economics of generation	1	4,5,6
c	Distribution of power ,tariffs, load shearing	2	4,5,6
d	Instrumentation and control of system electric power station	2	4,5,6
e	Measurement of chemical composition	1	4,5,6
f	Impurity measuring instruments, steam generator control	2	4,5,6
Guidelines for the examiner and paper setter. 1)No Numerical treatment			

Reference Books:

1. Arora, Domkumdawar, "Power Plant Engineering" Dhanpatrai and Sons,
2. G. D. Rai , "An Introduction to Power Plant Technology", , Khanna Publication.
3. R. K. Rajput , Power Plant Engineering, S .Chand
4. J. b. Gubta, "Power Plant Engineering".
5. P. k Nag, "Power Plant Engineering", Tata Mccgraw Hills
6. S . P. Sukhatma ;- "Solar Energy"
7. Chakraborti, Soni, Gupta " A Power Plant System Engg", Dhanpatrai Publication
8. http://nptel.iitm.ac.in

Electrical Measurement-I

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of International system of units, Importance of these International systems of units.

	Unit - I	**Lectures required**	**Reference No**
a	Definition of unit , CGS system of unit, SI system, absolute unit ,fundamental and derived units & practical units, MKS system	1	1,4,5
b	Dimensions of mechanical quantity, dimensional equations , electrostatic system of unit, electromagnetic system of unit,	2	1,4,5
c	Determination of absolute units, absolute measurement of current, Rayleigh current balance method, absolute measurement of resistance, Lorenz method	2	1,4,5
d	Magnetic measurements: measurement of flux density, measurement of magnetic force , Flux meter, permeameters	2	1,4,5
e	Testing of ring specimen, determination of B-H curve, determination of Hysteresis loop, testing of bar specimen.	1	1,4,5
f	Methods of measurement of iron losses, Iron loss test at power frequency. Effect of voltage, frequency, form factor on iron loss. Separation of iron losses	1	1,4,5,2
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Numerical based on iron losses and separation of iron losses should be included.			

Unit – II

Teacher should facilitate learning of measurement of power, power factor ,classification and measurement of resistance and potentiometer.

	Unit - II	Lectures required	Reference No
a	Measurement of Active, Reactive and Apparent power in 3 phase circuit, Measurements of power in 3 phase circuit for balanced and unbalanced load by one wattmeter method, two wattmeter method measurement of power using instrument transformer,	2	1,4,5
b	Power factor, Effect of power factor on wattmeter reading.	1	1,4,5
c	Measurements of resistance : classification of resistance, measurement of medium resistance, measurement of low resistance, measurement of high resistance ,	2	1,4,5
d	Basic potentiometer circuit , Crompton's potentiometer, multiple range potentiometer, constructional details of potentiometer	2	1,4,5
e	Measurement of earth resistance, fall of potential method, earth tester, factor effecting on earth resistivity	2	1,4,5
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part of power measurement, basic potentiometer. 2) Numerical based on measurement of resistance and power measurement should be included.			

UNIT III

Teacher should facilitate learning of different measuring instruments their characteristics and detail study of galvanometer.

	UNIT III	Lectures required	Reference No
a	Measuring instruments (General theory): Desirable qualities of measuring instruments, Classification of Instruments	2	4,5
b	Definitions and description of Static and Dynamic Characteristic of an instrument, accuracy, linearity, reproductively, sensitivity, resolution, speed of response.	2	4,5
c	Galvanometer: Construction. Deflection, controlling,	2	4,5

	damping & balancing systems of D'Arsonval, galvanometers.		
d	Ballistic galvanometers: Construction. Deflection, controlling, damping & balancing systems. Vibration galvanometers: Construction. Deflection, controlling, damping & balancing systems.	1	4,5
e	Sensitivity of galvanometer : Current sensitivity, voltage sensitivity, megohm sensitivity.	1	4,5
Guidelines for the examiner and paper setter. 1) Question should not be asked on general theory of instruments.			

Unit – IV

Teacher should facilitate learning of construction and working of ammeter and voltmeter, PMMC instruments, moving iron instruments.

	Unit - IV	**Lecture required**	**Reference No**
a	Ammeters and Voltmeters : Construction Principles of Voltage and Current measurement, Range Extension of Ammeter and Voltmeter , Different Methods of range extension of Ammeter and Voltmeter. (Simple numerical) , Calibration of Ammeter and Voltmeter.	2	1,4,5
b	Different Methods of range extension of Ammeter and Voltmeter. (Simple numerical), Calibration of Ammeter and Voltmeter.	1	1,4,5
c	Principle of operations, torque equations and errors of PMMC, Moving iron and Electro-static instruments. Extension of ranges using short and multipliers.	2	1,4,5
d	Instrument transformers: Theory, Expression for ratio and phase angle errors.	2	1,4,5
e	Design consideration and testing. Precautions in using the instruments transformers	1	1,2,4
Guidelines for the examiner and paper setter. 2) Question should not be asked on general theory of ammeter and voltmeter. 3) Numerical based on range extension of ammeter & voltmeter should be included.			

Unit – V

Teacher should facilitate learning of construction and working of ammeter and voltmeter, PMMC instruments, moving iron instruments.

	Unit - V	Lecture required	Reference No
a	Wattmeter's and Energy meters : Construction and principle of operation of electrodynamometer and conduction type wattmeter	2	1,4,5
b	Construction and working of low P. F. wattmeter, Errors and their compensation.	2	1,4,5
c	Constructional feature & principle of working of single phase and three-phase induction type energy Meter.	2	1,4,5
d	Different types of errors and their compensation, Calibration of energy meter, Concept of Electronic energy meter.	1	1,4,5
e	Numerical on energy meter, wattmeter and errors of energy meter.	1	4,5
Guidelines for the examiner and paper setter. 1) Question should not be asked on general theory wattmeter and energy meter. 2) Numerical based on wattmeter and energy meter and errors of energy meter should be included.			

Reference Books:

1. E. W. Golding. , "Electrical Measurements and Measuring instruments", Reem Publication.
2. C. T. Baldwin. , "Fundamentals of Electrical Measurements", Kalyani Publication
3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. "Electrical & Electronic Measurement and Instrumentation" Danpant Rai & Co.
5. J.B. Gupta, "Electrical & Electronic Measurement and Instrumentation", S K Kataria & Son.
6. http://nptel.iitm.ac.in

Power System-I

Teacher, paper setter and Examiner should follow the guidelines as given below.

Unit-I

Teacher should facilitate learning of different conventional sources of Power Generation.

	Generation	**Lectures required**	**Reference No.**
a	Types of generating plants, Hydro Electric power plant: Basic requirements, site selection principle of working of Hydro Electric power plant, main components and auxiliary components of Hydro Electric power plant	02	1,2,3
b	Hydro Electric power plant: Schematic block diagram and role played by each block for Hydro Electric power plant	01	1,2,3
c	Thermal Electric Power Plant: Basic requirements, site selection and principle of working	01	1,2,3
d	Thermal Electric Power Plant: Main components and auxiliary components	01	1,2,3
e	Thermal Electric Power Plant: Schematic block diagram and role played by each block	01	1,2,3
f	Nuclear Electric power plant: Basic requirements, site selection and principle of working	01	1,2,3
g	Nuclear Electric power plant: Main components and auxiliary components	01	1,2,3
h	Nuclear Electric power plant: Schematic block diagram and role played by each block	01	1,2,3
	Guidelines for the Examiner and Paper setter. 1)Question should not ask on Introductory part 2)No numerical should not for above unit		

Unit-II

Teacher should facilitate learning of different non conventional sources of Power Generation.

Non-conventional sources of energy		**Lectures required**	**Reference No.**
a	Solar power plant: Principle of working, main components and auxiliary components	02	1,2,3
b	Solar power plant: Schematic block diagram and role played by each block	01	1,2,3
c	Tidal power plant:Principle of working, main	01	1,2,3

	components and auxiliary components, schematic block diagram and role played by each block		
d	MHD power plant: Principle of working, main components and auxiliary components	01	1,2,3
e	MHD power plant :Schematic block diagram and role played by each block	01	1,2,3
f	Fuel cells :Principle of working, main components and auxiliary components	01	1,2,3
g	Fuel cells :Schematic block diagram and role played by each block	01	1,2,3
h	Geothermal Energy :Principle of working, main components and auxiliary components, schematic block diagram and role played by each block	01	1,2,3
	Guidelines for the Examiner and Paper setter. 1)Question should not ask on Introductory part 2)No numerical should not for above unit		

Unit-III

Teacher should facilitate learning of different Power plant terminology.

	Power plant terminology	**Lectures required**	**Reference No.**
a	Classification of power plants :Base load Peak load & Intermediate load plants	01	1,2,3
b	Hydrograph: Nature of hydrograph and its applications in power system	01	1,2,3
c	Flow duration curve :Nature of Flow duration curve and its applications in power system	01	1,2,3
d	Category of load curves : Nature of load curve for Domestic, Commercial, Industrial, Agricultural, Traction	01	1,2,3
e	Load duration curve: Nature of Load duration curve and its applications in power system	01	1,2,3
f	Load factors :Meaning and its application in power system	01	1,2,3
g	Demand factor, Diversity factor: Meaning and its application in power system	01	1,2,3
h	Plant capacity factor, Plant use factor: Meaning and its application in power system	01	1,2,3
	Guidelines for the Examiner and Paper setter. 1) Question should not ask on Introductory part		

	2) Numerical based on Load factors, Demand factor, Diversity factor, Plant capacity factor, Plant use factor may be asked.

Unit-IV:

Teacher should facilitate learning of different Major electrical equipments in power plants

Major electrical equipments in power plants		**Lectures required**	**Reference No.**
a	Alternators: Descriptive treatment of ratings of alternators. special features and field of use	01	1,2
b	Alternators :Special features and field of use	01	1,2
c	Transformers : Descriptive treatment of ratings, special features and field of use	01	1,2
d	bus bars : Descriptive treatment of ratings, special features and field of use	01	1,2
e	exciters, and excitation systems : Descriptive treatment of ratings, special features and field of use of transformers	01	1,2
f	control panels : Descriptive treatment of ratings, special features and field of use	01	1,2
g	metering equipments in generating stations : Descriptive treatment of ratings, special features and field of use	01	1,2
h	control room equipments in generating stations : Descriptive treatment of ratings, special features and field of use	01	1,2
	Guidelines for the Examiner and Paper setter. 1) Question should not ask on Introductory part 2) No Numerical should not ask for above unit		

Unit-V

Teacher should facilitate learning of Transmission systems.

Transmission		Lectures required	Reference No.
a	3 phase overhead transmission lines: Importance of 3 phase overhead transmission lines in power systems & factors to be considered while planning their layout	01	1 ,5
b	Resistance, skin effect: Definitions and concept	01	1 ,5

c	Inductance and its estimation: Two-wire-single-phase, Single and double circuit lines, with transposition and without transposition	01	1 ,5
d	Inductance and its estimation:3-wire-3-phase, Single and double circuit lines, with transposition and without transposition	01	1 ,5
e	Equal/unequal and horizontal spacing	01	1 ,5
f	Circuit representation of lines: Classification of lines based on length as short, medium & long transmission lines	01	1 ,5
g	Representation of transmission line as tee circuit : Using r-l-c parameter, voltage and current relation of short & medium transmission line.	01	1 ,5
h	Representation of transmission line as pie circuit : Using r-l-c parameter, voltage and current relation of short & medium transmission line.	01	1 ,5
	Guidelines for the Examiner and Paper setter. 1) Question should not ask on Introductory part 2) Numerical based on Inductance and its estimation, Representation of transmission line as tee circuit, Representation of transmission line as pie circuit may be asked		

Reference Books: -

1. B.R.Gupta, "Generation of Electrical Energy", S Chand Publication
2. William Stevenson ,"Elements of Power System Analysis" M-H international addition
3. OllE Elgerd, "Electrical Energy System Theory", second edition, TMH.
4. J.B.Gupta, "A Course in Electrical Power System", Dhanpat Rai and Sons' Publication
5. http://nptel.iitm.ac.in

Electrical Engineering Materials

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Electrical Engineering Materials, classification of materials, conducting materials properties and applications.

Conductors		**Lecture required**	**References**
a	Classification: High conductivity, high resistivity materials:	01	1,6
b	Fundamental requirements of high conductivity materials and high resistivity materials. Physical properties and characteristics of high conductivity and high resistivity materials. Applications of high conductivity and high resistivity materials.	02	1,6
c	Mobility of electron in metals Motion of an electron in electric field, equation of motion of an electron, current carried by electron, mobility.	01	1,6
d	Factors affecting resistivity of electrical material. Explain the physical parameters such as temperature, composition etc. Explain the factors briefly: Temperature, alloying, cold work, ageing. Thermal conductivity of metals- WIDEMANN Franz law.	02	1,6
e	Thermoelectric Effect: See back effect, Peltier effect. Explain: See back effect, Peltier effect with practical applications.	01	1,6
f	Commonly used high conducting materials, copper, aluminum, bronze brass, properties, characteristics Constantan, platinum, nichrome, properties, characteristics and applications. Explain the commonly used engineering materials with their properties, characteristics and applications.	01	1,6
g	Materials used for AC and DC machines: Explain the different conducting materials with their application for ac and dc rotating machines, transformer, bus bars, and circuit breaker contacts.	01	1,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. No numerical treatments.			

Unit - II

Teacher should facilitate learning of semiconductor and superconductor materials properties and applications.

Semi-Conductors and Superconductors		**Lectures required**	**References**
a	General concepts, energy bands. Energy bands in solids, conductivity of insulators, metals and semiconductors in terms of energy bands.	02	1,6
b	Types of semiconductors: intrinsic Semi-conductors, extrinsic Semi-conductors. Explain in detail: intrinsic Semi-conductors, extrinsic Semi-conductors	02	1,6
c	Compound semiconductor, amorphous semiconductor. Properties and applications of Compound semiconductor, amorphous semiconductor.	01	1,6
d	Hall effect, drift, mobility, diffusion in Semiconductors	01	1,6
e	Semi-conductors and their applications. Explain the different semiconductor materials for fabrication of semi-conductor devices. Application of semiconductor materials.	01	1,6
f	Superconductors: Superconductivity, Properties of Superconductors, Critical field Explain the basic terms: Superconductivity, Critical field. Superconductor materials. Properties of Superconductors and applications.	01	1,6
g	Meissner effect, Type-I and type-II Superconductors. Explain briefly: Meissner effect, Type-I and type-II Superconductors.	01	1,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part.			

Unit - III

Teacher should facilitate learning of dielectric and insulating materials properties and applications, breakdown mechanism in dielectric materials.

Dielectrics and Insulators		**Lectures required**	**References**
a	Properties of gaseous, liquid and solid dielectric, dielectric as a field medium.Dielectric parameters, Internal fields in solid and liquids, Types of dielectric materials	02	1,6
b	Electric conduction in gaseous, liquid and solid dielectric	01	1,6
c	Breakdown in dielectric materials, mechanical and electrical properties of dielectric materials	01	1,6
d	Effect of temperature on dielectric materials, polarization, loss angle and dielectric loss	01	1,6
e	Petroleum based insulating oils, transformer oil, capacitor oils, and properties. Properties of insulating oils and applications for distribution and power transformer, capacitors.	01	1,6
f	Classification of insulation (Solid) and application in AC and DC machines. Explain the thermal classification of insulating materials. Explain application of different insulating materials for rotating ac and dc machine, transformer, capacitors, cables and wires.	01	1,6
g	Solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling and bounding materials, fibrous, film, mica, rubber, mica based materials, ceramic materials. Briefly describe the properties and application of Solid electrical insulating materials for the different electrical and electronic applications.	01	1,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part.			

Unit - IV

Teacher should facilitate learning of basic terms related to magnetic materials, classification, properties and applications for ac and dc machines.

Magnetic Materials		**Lectures required**	**References**
a	Basic terms, Classification of magnetic material, Explain: Basic terms, diamagnetism, paramagnetism, ferromagnetism. Classification of magnetic material as diamagnetic, paramagnetic, ferromagnetic, anti - ferromagnetic and amorphous materials.	02	1,6
b	Diamagnetic, paramagnetic, ferromagnetic material. Properties and application of diamagnetic, paramagnetic, ferromagnetic material.	01	1,6
c	Hysteresis loop, magnetic susceptibility, coercive force, curie temperature. Briefly explain the hysteresis loop for induction motor, transformer, and other ac and dc machine, Importance of hysteresis loop.	01	1,6
d	Magneto-striction, factors affecting permeability and hysteresis loss.	01	1,6
e	Common magnetic materials:Explain common magnetic materials: Iron and silicon alloys, Nickel iron alloys, platinum alloys, permanent magnet materials and design of permanent magnets.	01	1,6
f	Soft and hard magnetic materials: Properties, grain orientation, magnetic materials for electrical devices, selection of core material for ac and dc machines, permanent magnet material.	01	1,6
g	Electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet.Explain the properties and application of electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet	01	1,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part.			

Unit - V

Teacher should facilitate learning of modern engineering materials for the different electronic components, Nanomaterials, solar/photo voltaic systems.

Modern Engineering Materials		**Lectures required**	**References**
a	Materials for Electronic Components Resistors, Capacitors, Inductors, Relays	01	1,6
c	Bipolar transistors, Field effect transistor (FET)	01	1,6
d	Integrated circuits	01	1,6
e	Power devices:Silicon controlled rectifier, IGBT, MOSFET, GTO	01	1,6
f	Nanomaterials a) Introduction, Nanotechnology b) Nanodevices. Briefly introduce the nanotechnology and its application, nanotools, Nanomaterials, Nanodevices and its applications for non electric memory devices.	02	1,6
g	Solar/Photovoltaic Cell a) Introduction, Photo generation of charge carriers, p-n junction b) Light absorbing materials: Silicon thin films, concentrating photovoltaic. Explain: Photo generation of charge carriers, p-n junction. Light absorbing materials: Silicon thin films, concentrating photovoltaic with application for the solar photovoltaic system.	02	1,6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part.			

Reference Books:

1. A.J.Dekker, “Electrical Engineering Materials”.
2. S.P.Seth and P.V.Gupta, “A course in Electrical Engineering Materials”, Dhanpat Rai .
3. C.S.Indulkar and S.Thiruvengadam, “Electrical Engineering Materials”, S Chand Pub
4. S.P.Chhaiotra and B.K.Bhat, “Electrical Engineering Materials”.
5. Electrical Engineering Materials: T.T.T.I Chennai, TMH.
6. R.K.Rajput, “Electrical Engineering Materials”, Laxmi Publication.
7. http://nptel.iitm.ac.in

Soft Skills – III

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate the learning basic foundation of mathematics.

1.	Arithmetic-1		Lecture required	Reference No
	a	Number Systems: Basic Formulae, Divisibility Rules, Speed Maths, Remainder Theorem, Different Types of Numbers, Applications	01	01
	b	HCF, LCM and Linear Equations HCF – Successive Division and Prime Factorization Methods, LCM – Successive Division and Prime Factorization Methods, Applications, Linear Equations – Elimination Method, Substitution Method, Applications	01	01
	c	Averages and Mixtures Concept of Average, Faster Ways of Finding It, The Allegation Method, Applications	01	01

Unit II

Teacher should facilitate the learning basic foundation of mathematics.

2.	Arithmetic-2		Lecture required	Reference No
	a	**Percentages** Concept of Percentage, Working with Percentages Applications	01	01
	b	**Profit and Loss** Difference between Cost and Selling Price, Concept of Profit Percentage and Loss Percentage, Applications	01	01
	c	**Time and Work** Basic Time and Work Formula, Relation between Time and Work, Applications	01	01

Unit III

Teacher should facilitate the learning basic foundation of mathematics.

3.	Arithmetic-3		Lecture required	Reference No
	a	**Permutations and Combinations** Sum Rule of Disjoint Counting, Product Rule of Counting Concept of Factorial, Permutations, Linear Permutations, Combinations, Circular Permutations, Applications	01	01
	b	**Probability** Definition and Laws of Probability, Mutually Exclusive Events, Independent Events, Equally Likely Events, Exhaustive Events, Cards, Dice, Applications	01	01
	c	**Time and Distance** Speed, Conversion Factors for Speed, Average Speed, Moving Bodies – Passing, Crossing and Overtaking, Relative Speed, Boats and Streams, Applications	01	01

Unit IV

Teacher should facilitate learning of critical thinking.

4.	Non-Verbal Reasoning		Lecture required	Reference No
	a	**Analogies** Different type of examples of analogies and its Applications	01	02
	b	**Classification** Different type of examples of analogies and its Applications	01	02
	c	**Sequences** Different type of examples of analogies and its Applications		02

Unit V

Teacher should facilitate the learning of a deep sense of analysis towards solving a problem

5.	Analytical Reasoning		Lecture required	Reference No
	a	**Analytical Puzzles** Classification Puzzles, Ordering Puzzles, Assignment puzzles, Applications	01	03
	b	**Letter and Number Series** Different Types of Letter Series, different types of Number Series, mixed Series	01	03
	c	**Coding and Decoding** Letter Coding, Number Coding, Mixed Coding, Odd Man Out, Applications	01	03

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Power Plant Engineering Lab

Teacher should facilitate learning following lab experiments:

Sr. No	Experiments	Lab Hour per Week
1	Study of modern thermal power plant :	2
2	Study of boiler mountings and accessories	2
3	Demonstration and trail on diesel engine	2
4	Study of modern hydro electric power plant	2
5	Demonstration and trail on any water turbine i.e. Pelton wheel/Francis/Kaplan	2
6	Study of modern nuclear power plant.	2
7	Assignment on boiler heat balance sheet and cycles.	2
8	Assignment on economic of power plant	2
9	Assignment on instrumentation and control of power plant	2

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. Arora, Domkumdawar, "Power Plant Engineering" Dhanpatrai and Sons,
2. G. D. Rai , "An Introduction to Power Plant Technology", , Khanna Publication.
3. R. K. Rajput , Power Plant Engineering, S .Chand
4. J. b. Gubta, "Power Plant Engineering".
5. P. k Nag, "Power Plant Engineering", Tata Mccgraw Hills
6. S . P. Sukhatma ;- "Solar Energy"
7. Chakraborti, Soni, Gupta " A Power Plant System Engg", Dhanpatrai Publication

Electrical Workshop Lab

Teacher and Examiners should follow the guidelines as given below.

Experiments

Teacher should facilitate learning following lab experiments:

Sr. No	Experiments	Lab Hour required
1	Study of different electrical symbols: Draw symbols of different electrical sources, elements, machines, measuring instruments, protective devices, safety symbols and different applications.	2
2	Study of electrical shocks and safety precautions: Study different electrical shocks and their causes, safety precautions, preventive measures.	2
3	Study of different Cables: Show different types of cables, explanation of construction, insulation, standards and specifications, choice of cable and different joints.	2
4	Study of different wires: Show different types of wires, explanation of construction, insulation, standards and specifications, choice of wire	2
5	Study of wiring accessories: Show and explain different types of switches, socket plugs, wooden boards, ceiling rose, main switches (ICDP/ICTP/MCB), junction boxes, distribution boxes, fuse boards.	2
6	Selection of fuse & MCB. a. Explain basic principle of fuse and MCB, applications. b. Explain classification of fuse and MCB c. Explain choice of fuse and MCB	2
7	Study of domestic wiring. a. Draw and explain basic connections for domestic wiring. b. Choice of correct size of wire and accessories. c. Wire up a switch boards for domestic requirements.	2
8	Study of different lamp circuits. a. Draw and explain basic connections and construction of lamp. b. Wire up a connection for fluorescent tube light. c. Wire up a lamps to create a single phase and three phase load bank.	2
9	Industrial visit reports. a. Visit electrical power station, electrical substation, electrical workshop, electrical process industries and submit its	2

	detailed report. b. Conduct minimum two industrial visits.	

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on assignments. Evaluation will be based on performance in oral examination.

Reference Books:

1. William A. Thue, “Electrical power cable engineering”
2. S L Uppal, “Electrical Wiring, Estimation and Costing”
3. Surjit Singh, “Electrical wiring, Estimation and Costing”
4. S K Bhattacharya, “Electrical wiring, Estimation and Costing”
5. B R Gupta, “Electrical Wiring, Estimation and Costing”

Electrical Measurement-I LAB

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Experiments

Teacher should facilitate learning following lab experiments:

Sr. No.	Title of Experiments	Lab hours required
1.	Measurement of active power in three phase circuit by two wattmeter method: Study of star and delta connection. Study of power measurement i.e. active power, reactive power & apparent power. Effect of power factor	02
2.	Measurement of reactive power by two wattmeter and single wattmeter: Study of power measurement. Study of single wattmeter. Study of two wattmeter	02
3.	Calibration of single phase energy meter at different P.F.'s: Study of energy meter. Study of calibration of instrument. Measurement of errors regarding to energy meter. Effect of power factor.	02
4.	Calibration of three phase two elements energy meter at different P.F.'s: Study of energy meter. Study of calibration of instrument. Measurement of errors regarding to energy meter. Effect of power factor.	02
5.	D.C. potentiometer for calibration of ammeter and voltmeter: Study of basic potentiometer circuit. Standardization of dc potentiometer.Calibration of ammeter by using potentiometer. Calibration of voltmeter by using potentiometer	02
6.	Kelvin's double bridge: Measurement of low resistance: Classification of resistance, measurement of low value resistances by using Kelvin double bridge circuit.	02
7.	Measurements of phase angle error and ration error of C.T: Study of current transformer. study of phase angle error and ratio error of current transformer	02
8.	Measurements of phase angle error and ration error of P.T: Study of potential transformer. study of phase angle error and ratio error of potential transformer	02
9.	Epstein square: Measurement of Flux	02
10.	Measurement of earth resistance: Factors affecting earth resistance, Measurement of earth resistance.	02
11.	Measurement of insulation resistance by Megger: Study of Megger. Measurement of insulation resistance.	02

Note: Lab file should consist of minimum **Eight** experiments**.**

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in practical examination.

Reference Books:

1. E. W. Golding. , "Electrical Measurements and Measuring instruments", Reem Publication.
2. C. T. Baldwin. , "Fundamentals of Electrical Measurements", Kalyani Publication
3. Cooper and Derfllick, "Electronic Instrumentation and Measurements Techniques", 3rd edition, Prentice-Hall of India.
4. A. K. Sawney. "Electrical & Electronic Measurement and Instrumentation" Danpant Rai & Co.
5. J.B. Gupta, "Electrical & Electronic Measurement and Instrumentation", S K Kataria & Son.

Electrical Engineering Material Lab

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Experiments

Teacher should facilitate learning following lab experiments:

Sr. No.	Title of Experiments	Lab hours required
1	Testing of insulating oil as per I.S. a. Test the different samples of transformer oil as per I.S b. Compare the breakdown voltage of different samples.	02
2	Testing of solid insulating materials as per IS a. Test the different solid insulating materials as per I.S. (insulating paper, pressboards, cloth, rubber, mica, plastics)	02
3	Testing of power capacitors as per IS a. Study the capacitors and the material used for the dielectric medium. b. Observation Reactive current, reactive power and active power loss.	02
4	Measurements of resistivity of conducting materials a. Study the effect of resistivity on conductivity of materials. b. Measure the resistivity of copper, aluminum, brass, bronze.	02
5	Measurements of resistivity of resistive material. a. Study the effect of resistivity on resistive materials. b. Measure the resistivity of constantan, nichrome.	02
6	Study and use of Gauss meter. a. Study the Gauss meter. b. Use the Gauss meter for measurement of magnetic flux.	02
7	Use of spark gap for high voltage testing. a. Study the spark gap set up for the high voltage testing. b. Use the spark gap to study the breakdown of air as an insulating material.	02
8	To study See back and Peltier effects.	02
9	Study of hysteresis loop of ferromagnetic materials.	02
10	Study of various insulating materials. a. Study the various insulating materials on the basis of thermal classification. b. Study the application of various insulating materials for ac and dc machines.	02

Note: Lab file should consist of minimum **Eight** experiments**.**

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in practical examination.

Reference Books:

1. A.J.Dekker, "Electrical Engineering Materials".
2. S.P.Seth and P.V.Gupta, "A course in Electrical Engineering Materials", Dhanpat Rai .
3. C.S.Indulkar and S.Thiruvengadam, "Electrical Engineering Materials", S Chand Pub
4. S.P.Chhaiotra and B.K.Bhat, "Electrical Engineering Materials".
5. Electrical Engineering Materials: T.T.T.I Chennai, TMH.
6. R.K.Rajput, "Electrical Engineering Materials", Laxmi Publication.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Teacher, Paper Setter & Examiner

Manual

for

Second Year Electrical Engineering

Faculty of Engineering and Technology

SEMESTER –IV

W.E.F 2013 – 2014

Analog & Digital Electronics

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit – I

	Unit-I	**Lectures required**	**References**
a	Review of rectifiers using diodes.	01	3,5
b	Introduction, BJT as a amplifier .	01	3,5
c	Analysis of CE and CC configuration using BJT,	02	3,5
d	Introduction to FET and FET as amplifier ,	02	3,5
e	Multistage amplifier,	01	3,5
f	Basic configuration of differential amplifier.	02	4
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Numerical on CE and CC configuration may be asked.			

Unit - II

	Unit-II	**Lectures required**	**References**
a	Operational amplifier, Op-amp parameters such as CMRR, slew rate , frequency response and gain limitations. (concept only).	01	1,2
b	Inverting ,non inverting amplifier.	01	1,2
c	Summer and substractor .	02	1,2
d	Op-amp applications: Integrator , differentiator	02	1,2
e	Op-amp as Comparator , Schmitt trigger,	01	1,2
f	Instrumentation amplifier , precision rectifiers	01	1,2
g	Waveform generation using Op-amp – sine, square and triangular	01	1,2
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) No numerical treatments			

Unit - III

	Unit-III	**Lectures required**	**References**
a	Types of voltage regulators only concepts	01	3,5
b	Series and shunt voltage regulators (Transistor series regulator),	01	3,5
c	Protection circuits for voltage regulators,	01	3,5
d	Fixed and variable voltage regulators using ICs Viz	01	1,2

	78xx,79xx,LM723, LM317,		
e	Study of VCO and PLL,	02	1,2
f	IC 555 and modes of operation-Astable, Monostable	02	1,5
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Simple numerical on voltage regulator may be asked.			

Unit – IV

	Unit-IV	**Lecture required**	**References**
a	Introduction to K Map, two, three and four variables , K Map with examples	01	4
b	Concept of Latch, SR Flip flop, D type Flip flop	01	4
c	Type of triggering, edge and level	01	4
d	JK flip flop T type flip flop,Race around condition JK Flip flop	01	4
e	JK Master slave flip flop, Applications	02	4
f	Opto coupler , opto isolator, opto decoder, opto encoder	02	4
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) No numerical treatments			

Unit - V

	Unit - V	**Lecture required**	**References**
a	Shift register, various types and concept	02	4
b	Bidirectional shift register	02	4
c	Ripple counter(asynchronous)counter	01	
d	Synchronous counter only two and three bit operation	01	4
e	Twisted ring counter	01	4
f	Up – down counter,	01	4
Guidelines for the examiner and paper setter. 1) 1) Question should not be asked on introductory part. 2) Question on counter designing should not be asked.			

Reference Books:

1. Gaikwad R, “Operational Amplifier”, PHI New Delhi
2. K.R.Botkar, “Integrated Circuit” , Khanna Publication,New Delhi
3. Milman Halkias , “Principles of Electronics”, TMH
4. R P Jain, “Digital Electronics”, TMH
5. Salivahen, “Electronic Devices and Circuit” , TMH
6. http://nptel.iitm.ac.in

Network Analysis

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit - I

	Unit-I	**Lectures required**	**References**
a	Introduction of Network Analysis **:** Continuous and Discrete, Fixed and Time varying systems	01	1,2,4,5
b	Linear and Nonlinear, Lumped and Distributed systems, Passive and Active networks and systems	01	1,2,4,5
c	Independent and Dependent sources, Impulse, Step, Ramp signals	02	1,2,4,5
d	Sinusoidal, Square, Saw tooth signals	01	1,2,4,5
e	Magnetic coupling, Concept of Self and Mutual inductance	01	1,2,4,5
f	Coefficient of coupling, Inductive coupling in series and parallel	01	1,2,4,5
g	Dot convention in Coupled coils, Modeling of coupled circuits	01	1,2,4,5

Guidelines for the examiners and paper setters:

1) Numerical should not be asked from Sl. No. a,b,c,d.
2) Numerical based on Self and Mutual inductance, Coefficient of coupling, Inductive coupling in series and parallel, Dot convention in Coupled coils, Modeling of coupled circuits.

Unit - II

	Unit-II	**Lectures required**	**References**
a	Source transformation.	01	1, 10, 2
b	Mesh and super-mesh analysis, Loop analysis.	01	1, 2, 4,
c	Node and super-node analysis.	02	1, 2, 4, 5
d	Network theorems (Application in AC circuits with independent and dependent sources**):** Superposition theorem.	01	1, 2, 4, 5, 11
e	Thevenin's and Norton's theorem.	01	1, 2, 4, 5, 11
	Maximum power transfer theorem.	01	2, 4
f	Millman's theorem and its application in three phase unbalanced circuit analysis.	01	2, 4

Guidelines for the examiner and paper setter.

1. Numericals should be asked from Sl. No. a,b,c,d,e,f.
2. Mesh and super-mesh analysis, Loop analysis, Node and super-node analysis: Application in AC circuits with independent and dependent sources
3. Superposition theorem, Thevenin's and Norton's theorem, Maximum power transfer theorem, Millman's theorem: Application in AC circuits with independent and dependent sources

Unit - III

	Unit-III	**Lectures required**	**References**
a	**Laplace transforms:** Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits.	01	1,2,4,5,10,11
b	Transient analysis of different electrical circuits with initial conditions.	01	1,2,4,5,10,11
c	Transient analysis of different electrical circuits without initial conditions.	01	1,2,4,5,10,11
d	Concept of Convolution theorem and its applications.	01	1,2,4,5,10,11
e	Solution of Problems with DC & AC sources.	02	1,2,4,5,10,11
f	**Fourier method of waveform analysis:** Fourier series and Fourier Transform (in continuous domain only)	01	1,2,5,10
g	Application in circuit analysis.	01	1,2,5,10

Guidelines for the examiner and paper setter.

1. Numerical should be asked from Sl. No. a,b,c,d,e,f,g.

Unit – IV

	Unit-IV	**Lectures required**	**References**
a	Concept of Network graph, Terminology used in network graph: oriented or directed graph, branch, tree, co-tree,	01	2,10
b	Incidence matrix.	01	2,10
c	Tie-set matrix, Cut set matrix.	02	2,10
d	Network Equilibrium equations in matrix form:	02	2,10

	Mesh or Loop or KVL Equilibrium		
e	Node or KCL Equilibrium equations.	01	2,10
f	Duality: Construction of dual networks by mathematical and graphical method.	01	2,10

Guidelines for the examiner and paper setter.

1. Numerical should be asked from Sl. No. b,c,d,e,f.
2. Numerical should be asked on Incidence matrix, Tie-set matrix, Cut set matrix, Network Equilibrium equations in matrix form: Mesh or Loop or KVL Equilibrium, Node or KCL Equilibrium equations, Duality: Construction of dual networks by mathematical and graphical method.

Unit - V

	Unit - V	**Lectures required**	**References**
a	Introduction to Two port networks analysis: Open circuit Impedance parameters	01	1,2,4,5,10
b	Short circuit Admittance parameters, Transmission parameters	01	1,2,4,5,10
c	Hybrid parameters, Inter conversion of parameters	01	1,2,4,5,10
d	Interconnection of Two port parameters: cascade connection, series connection, parallel connection	01	1,2,4,5,10
e	System and Network functions: Driving point impedance and Admittance functions,	01	1,2,4,5,10
f	transfer impedance and admittance, voltage and current transfer ratio	01	1,2,4,5,10
g	**Filter circuits:** Analysis and synthesis of Low pass filters, High pass	01	12
h	Band pass, Band reject filters.	01	12
i	All pass filters (first and second order only) using operational amplifier.		12

Guidelines for the examiner and paper setter.

1. Numericals should be asked from Sl. No. a,b,c,d,e,f.
2. Numericals should be asked on : Open circuit Impedance parameters, Short circuit Admittance parameters, Transmission parameters , Hybrid parameters,Inter conversion of parameters , cascade connection, series connection, parallel connection, Driving point impedance and Admittance functions, transfer impedance and admittance, voltage and current transfer ratio.

Reference Books:

1. W.H. Hyat, J.E. Kemmerly & S.M "Durbin, Engineering Circuit Analysis", Tata Mc Graw Hill.
2. D. Roy Chowdhury, "Networks and Systems", New Age International Publishers
3. C.L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
4. A. Sudhakar & S.S. Palli, "Circuit and Networks: Analysis and synthesis", 4th edition. TMH.l
5. M.E. Valkenburg, "Network Analysis", Pearson Education.
6. D. Chattopadhay & P.C. Rakshit, "Fundamental of Electric Circuit Theory", S. Chand.
7. M. Nahvi & J.A. Edminister, "Schum's outline series, Electric Circuit", Tata Graw Hill.
8. Charles K. Alexander, Mathew. N.O. Sadiu, "Fundamental of Electric Circuits", Tata Mc Graw Hill
9. Syed A. Nasar, "Schaum's solved problem series, Electric Circuits", Tata Mc Graw Hill
10. A. Chakrabarty, "Circuit Theory (Analysis and Synthesis)", Dhanpat Rai & Co.
11. A. Bruce Carlson, "Circuits", Thompson
12. D. Roy Chowdhury, Shail Jain, "Linear Integrated Circuits", New Age International Publishers
13. http://nptel.iitm.ac.in

Electrical Machine-I

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Electrical Machines, construction working principle of DC generator.

DC Machine- Generator		**Lectures required**	**References**
a	Introduction of electrical machines, classification of machine, Construction. Construction of stator rotor, yoke and function of each part of D C machine. (Construction part should cover in lab with demonstration on opened machine)	01	6,7,8
b	Type of armature windings, factor and use of type of winding	01	1,8
c	Type of armature windings, factor and use of type of winding	01	1,8
d	**D.C. generator:** Basic principles of working, faraday's law of dynamical induced emf, explanation by two pole generator, derivation of e.m.f. equation and problem based on it.	01	1,8
e	Process of commutation, types of commutation, Causes of bad commutation and remedies.	01	1,8
f	Characteristics of self and separately excited generator ,magnetic saturation , internal and external characteristic and applications of different types of d.c .generator, calculation losses and efficiency of generators.	01	1,8
g	Losses and power stages in dc generator.	01	1,8
h	Armature reaction, effect and estimation of amp-turns.	01	1,8
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Numerical based on emf generated and efficiency should be included.			

Unit - II

Teacher should facilitate learning of Electrical Machines, construction working principle of DC motors, classification ,characteristic and control

	DC Motor	**Lectures required**	**References**
a	Construction Working principle of DC motor & significance of back e.m.f. ,direction of back emf induced.	01	6,7,8
b	Need of starter, type of starter, over current protection, under voltage release scheme in starter and reversing direction of rotation for all type of dc motors.	01	1,8
c	Classification of DC motors, derivation of general torque equitation. Torque equation for all type of dc motors,	02	1,8
d	Speed control by armature voltage and field control. numerical based on both methods	01	1,8
e	Characteristics and applications of different types of d.c. Motors, calculation of torque, speed , losses and efficiency.	02	1,8
f	Power stages in DC motor & Condition of maximum efficiency	01	1,8
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part and working principal. 2) Numerical based on speed control, torque, losses and efficiency should be included.			

Unit - III

Teacher should facilitate learning of process of commutation & testing of machines.

	Testing of DC Machines	**Lecture required**	**References**
a	Testing of dc machines, type of test like routine, type	01	1,8
b	Direct load test , Brake test on dc machines advantages and disadvantages,	02	1,8
c	Swinburn's test cal calculation of losses and efficiency.	02	
c	Regenerative method of testing , Hopkinson's test on equal rating dc shunt motor and series motors. Calculation of efficiency.	02	1,8
d	Field's test for series motor.	01	1,8

Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part and working principal. 2) Problem on each methods are expected.

Unit - IV

Teacher should facilitate learning of construction , working and performance of single phase transformer.

	Single Phase Transformer	**Lectures required**	**References**
a	Constructional details, arrangements of core and coils in shell type and core type transformer, action of transformer need of lamination and winding arrangement.	01	1,8
b	Derivation EMF equation, voltage and current ratios, concept of leakage flux and its effect, methods to reduce the Reactances.	01	1,8
c	General phaser diagrams on no load and load,	01	1,8
d	Open and short circuit test on transformer. Calculation of equivalent parameters, calculation of iron and copper losses.	02	1,8
e	Exact and approximate equivalent circuit referred to either side, transformation of parameters of equivalent circuit.	01	1,8
f	Efficiency, maximum efficiency, all day efficiency transformer rating, need of all day efficiency for distribution transformer. Numerical on efficiency and regulation.	02	6,7,8
g	Construction, working and application of auto transformer	01	6,7,8
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory, construction part and working principal. 2) Numerical are expected on OC & SC test, voltage regulation and equivalent circuit parameters .			

Unit - V

Teacher should facilitate learning of three phase transformer, working of three phase transformer, phaser group, parallel operation and special connections.

	Three phase Transformer	Lecture required	References
a	Polyphase Transformers-connecting a bank of three identical single phase transformer for three phase transformation, arrangement of core and winding	01	1,8
b	Comparison between a bank of three identical single phase transformers and a single three phase transformer.	01	1,8
c	Standard connections for three phase transformers, their voltage phasor diagrams, phasor groups, suitability of particular connection for supplying unbalanced loads. factors affecting the choice of connections	02	1,8
d	Need , requirement and condition of Parallel operation of three phase transformers, tap changer on transformer under no load and loaded condition.	02	1,8
e	Open delta or V-V connection, application and vector diagram. Need and application and out put rating under connection.	01	1,8
f	Scott connection for three phase to two phase transformation and vice-versa ,applications. Need and application and out put rating under connection.	01	1,8
g	Labelling and polarity test of three phase transformer.	01	1,8
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory, construction part and working principal.			

Reference Books:

1. E.W.Clayton. “Design and Performance of D.C. Machines”
2. M.G.Say. “Design and Performance of A.C. Machines” CBS Publication
3. Langsdorf, “ A.C.Machines,” TMH.
4. P.C.Sen. “D.C. Machines”, TMH.
5. Nagrath and Kothari “Electric Machine” –TMH
6. B. L. Theraja, “Electrical Technology”, Vol – II, S. Chand Publucation
7. P. S Bimbhra, “Electrical Machinery” 2/E, Khanna Publishers
8. Ashfaq Husain, “Electrical Machines”, Dhanpat Rai & Co.
9. http://nptel.iitm.ac.in

Electrical Installation, Estimation and Distribution

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning different supply system

Supply Systems		**Lectures required**	**References**
a	Supply Systems: Typical A.C. Supply Scheme A.C. transmission, D.C. transmission and comparison between them based on technical, stability and cost effectiveness, Types of transmission: overhead transmission, underground transmission and comparison between them.	02	1,3
b	Various systems of transmission: Dc systems : Two wire dc, two wire dc with midpoint earthed, dc three wire system.	02	1,3
c	Single phase ac systems : Single phase two wire, single phase two wire with midpoint earthed, single phase three wire system,	02	1,3
d	Two phase ac systems: Two phase three wire system, two phase four wire system	01	1,3
e	Three phase ac system : Three phase three wire system, three- phase four wire system.	01	1,3
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Theoretical question should be asked on part (a,b) 3) numerical and Prove that can be ask on part (c.b,d,e)			

Unit – II

Teacher should facilitate learning supports, conductors, and cables construction.

Overhead Transmission Line Components		**Lecture required**	**References**
a	The support –poles, towers, and their types, cross arm and clamps, guys and stays	01	1,3,4
b	Conductors-characteristics of conductor material, types of conductor- solid conductor, bundle conductor, concentrically standard conductor (ACA, ACSR conductor),	01	1,3
c	Insulators – types (pin, strain, shackle and	02	1,3,4

	suspension insulator), failure of insulators, potential distribution over suspension insulator string, string efficiency, method of improving of string efficiency.		
d	Underground cables ; classification , construction of cable, requirements of insulating materials , insulation resistance	02	3
e	capacitance dielectric stress in single-core/multi-core/ sheathed /armored cables	01	3
f	Grading of cables – capacitance grading and inter sheath grading.	01	3
Guidelines for the examiner and paper setter. 1) Numerical should be asked on string efficiency.			

Unit – III

Teacher should facilitate learning earthing, distribution system

Earthing and Design of Distribution System		**Lectures required**	**References**
a	Earthing : System earthing, Equipment earthing, method and material for earthing	02	1,3
b	Design of distribution system : General design consideration for distribution system , Requirements of distribution system	02	1,3,4
c	Connection scheme of distribution system,	01	3
d	Service mains, feeders, distributors.	01	3
e	A.C. distribution	02	1,3
f	D.C Distribution	02	1,3
Guidelines for the examiner and paper setter. 1) Numerical are expected on A.C. Distribution and D.C. Distribution			

Unit – IV

Teacher should facilitate learning IE rules, tariff, Introduction of SCADA and PLC.

Design and Estimation		**Lectures required**	**References**
a	IE rules related to estimation and installation	02	2,6,7
b	Design and estimation of installation of residential buildings, commercial, industrial heads as per IE rules .	03	2,6,7,8
c	Different types of tariffs.	01	1,3
d	Introduction to SCADA and PLC panels.	02	2,6,8

Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory. 2) Numerical are expected part (c)

Unit - V

Teacher should facilitate learning illumination scheme, laws of illumination, design of lighting scheme.

Illumination		**Lectures required**	**References**
a	Illumination : nature of light , definitions –plane angle , luminous flux luminous intensity , illuminance and their units, luminous efficiency.	01	1,4
b	laws of illumination – inverse square law and Lambert's cosine law , polar curves.	01	1,4
c	Requirements of good lighting scheme: Polar curves, direct, indirect , semi direct , semi-indirect lighting	02	1,4
d	Design of lighting scheme : factors to be considered , working plane space to height ratio, absorption factor, maintenance factor , depreciation factor , coefficient of utilization	02	1,4
e	design of illumination schemes for industrial workshops assembly halls, street lighting.	01	1,4
f	Design of flood lighting schemes: factors like reflection factor waste light factor and beam factor and design of such schemes for typical installation.	01	1,4
Guidelines for the examiner and paper setter. 1) Numerical can be asked on lighting scheme.			

Reference Books:

1. J.B.Gupta, "Transmission and Distribution" S.K.Kataria and Sons, New Delhi.
2. S.L.Uppal , "Electrical Wiring , Estimation and Costing" ,Khanna Publishers, New Delhi.
3. V.K.Mehta, "Principle of Power System" ,S.Chand, New Delhi
4. S.L.Uppal, "Electric Power", Khanna Publishers, New Delhi.
5. H.Pratap , "Art and Science of Electrical Utilization" ,Dhanpat Rai and Sons, New Delhi.
6. B.D.Arora, "Electric Wiring, Estimating and Costing", New Heights, New Delhi
7. S.K.Bhattacharya, "Electrical Estimation and Costing"
8. I.E.Rules.
9. http://nptel.iitm.ac.in

Numerical Techniques

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Number systems & errors in digital computations and solution of transcendental equation, simultaneous and polynomial equations

		Lectures required	**References**
a	Number systems & errors in digital computations, Transcendental & polynomial equations; concept of roots of an equation	2	1,4,5
b	Secant Method	2	2
c	Regula Falsi Method	2	5,3
d	Newton Raphson Method	2	3,4
e	Matrix Inversion Method	1	6
Guidelines for the examiner and paper setter. 1) No derivation is to be asked. 2) Questions on theory is also expected.			

Unit - II

Teacher should facilitate learning o f method and programming of Linear algebraic simultaneous equations .

	Unit-II	**Lectures required**	**References**
a	Gauss Method,gauss Elimination Method	3	2,3
b	Gauss Jordan	01	1
c	L-U Factorization	02	5,2
d	Jacobi's	02	3,4
e	Gauss Seidel Method	02	6,7
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Derivation should not be asked.			

Unit - III

Teacher should facilitate learning of interpolation methods

	Unit-III	**Lecture required**	**References**
a	Newton's forward and backward interpolation formula	2	2,3
b	Gauss's forward and backward interpolation formula	2	1,4
c	Lagrange's Formula	2	5,6
D	Central difference formula	1	3,4

E	Least Square approximation	1	6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory part. 2) Derivation should not be asked.			

Unit - IV

Teacher should facilitate learning of numerical differentiation and integration methods.

	Unit-IV	**Lecture required**	**References**
a	Newton's forward and backward differencen formulae for derivatives	3	2,3
b	Stirling's formula	2	1
c	Trapezoidal Rule	2	5,7
d	Simpson's 1/3 rd Rule	1	3,4
e	Simpson's 1/8 rd Rule	1	6,7
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory. 2) Derivation should not be asked.			

Unit - V

Teacher should facilitate learning of numerical solution of ordinary differential equation and special connections.

	Unit - V	**Lecture required**	**References**
a	Euler's method	2	2,3
b	Taylor Series method	2	1
c	Runge-Kutta methods	2	5,12
d	Runge-Kutta's fourth order formula	2	3,4
e	predictor-corrector methods	1	6
Guidelines for the examiner and paper setter. 1) Question should not be asked on introductory. 2) Derivation should not be asked.			

Reference Books:

1. Jain & Iyengar, "Numerical Methods for Scientific & Engineering Computation", 3rd edition, New Age international.
2. S.K.Gupta, "Numerical Methods for Engineers", New Age international.
3. Anita, "Numerical Methods for Scientists & Engineers", Tata McGraw Hill.
4. S.S. Shashtry, "Introductory Methods of Numerical", Tata McGraw Hill.
5. Rajaraman, "Numerical Methods & Computations", Tata McGraw Hill.
6. Kanti Swarup , P. K. Gupta, Man Mohan, "Operation Research", Sultan Chand & Son.
7. Yashwant Kanitkar., "Let us C".

C – Programming / MATLAB

Teacher, Paper setter and Examiners should follow the guidelines as given below Teacher should facilitate learning of Algorithms, Flowcharts and basic program development concepts.

Sr. No.	**Unit –I C Language Review**	**Lectures required**	**References**
a	Algorithms, flowcharts, Data types in C	01	1,6
b	The C character set: Constants, Variables and keywords.	01	1,6
c	The decision control structure	01	1,6

Sr. No.	**Unit –II Programm Development concepts**	**Lectures required**	**References**
a	The loop control structure	01	1,6
b	Functions and pointers and Arrays	01	1,6
c	Arrays	01	1,6

Unit - III

Teacher should facilitate learning of Algorithms, Flowcharts and C language programs for basic numerical techniques.

Sr. No.	**Unit –III Numerical computational techniques 1**	**Lectures required**	**References**
a	Solution of transcendental & polynomial equation.	01	1,6
b	Solution of bisection method.	01	1,6
c	Solution of Newton Raphson method.	01	1,6

Sr. No.	**Unit-IV Numerical computational techniques 2**	**Lectures required**	**References**
a	Solution of secant method.	01	1,6
b	Solution of linear equations using Gauss elimination method, Gauss seidal method and Gauss-Jordan methods.	01	1,6

Unit - V

Teacher should facilitate learning of basics of MATLAB, plotting tools and matrix interactive operations.

Sr. No.	**Unit – V MATLAB**	**Lectures required**	**References**
a	Introduction, Basics of MATLAB	01	7,8,9,10
b	Working with arrays of numbers	01	7,8,9,10
c	Creating and printing simple plots	01	7,8,9,10
d	Creating and executing a Script file, function file.	01	7,8,9,10
e	Interactive computations: Matrices and vectors, Matrix and array operation.		

C Programming /MATLAB LAB

Teacher, Paper setter and Examiners should follow the guidelines as given below
Teacher should facilitate learning following lab experiments:

Sr. No.	Title of Programs	Lab hours required
1	Bisection Method program. Finding the approximate roots of a given equation.	02
2	Secant Method program. Finding the approximate roots of a given equation.	02
3	Newton Raphson Method program. Finding the roots of non linear equations.	02
4	Gauss Elimination Method Program. Finding the roots of non linear equations.	02
5	Gauss seidal Method Program. Finding the roots of non linear equations.	02
6	Simpson`s 1/3 rd and 3/8 th rule program.	02
7	Arithmetic operations on matrix using MATLAB. Addition, subtraction, multiplication, inversion, determinant of matrix.	02
8	Plot the simple, 2-D and 3-D plots using MATLAB. Plot the simple plots for line, circle, functions (sine, cosine) surface, mesh, contour, curtain plot etc.	02
9	Find the roots of polynomial equations using MATLAB.	02
10	Find eigenvalues and eigenvectors, LU factorization.	02

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. Yashavant Kanetkar, "Let Us C", BPB Publications, 10/E, 2010.
2. Stephen G Kochan "Programming in C", Pearson Education, 3/E, 2004.
3. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
4. Jain & Iyengar, "Numerical Methods for Scientific & Engineering Computation", 3rd edition, New Age international.
5. S.K. Gupta, "Numerical methods for Engineers", New Age international.

6. Anita, “Numerical methods for scientists & Engineers”, Tata McGraw Hill.
7. Using MATLAB, Version 6, The Math Works, Inc., 2000.
8. MATLAB function reference, The Math Works, Inc., 2000.
9. Using MATLAB Graphics, Version 6, The Math Works, Inc., 2000.
10. MATLAB Release Notes for Release 12, The Math Works, Inc., 2000.

Analog & Digital Electronics Lab

Teacher, Paper setter and Examiners should follow the guidelines as given below
Teacher should facilitate learning following lab experiments:

Sr. No.	Title of Experiments	Lab hours required
1	Op-amp as square & sine wave generator	02
2	Op-amp as comparator & Schmitt trigger	02
3	Instrumentation amplifier using 3 Op-amps	02
4	IC 555 application – Astable, Monostable, Square wave generator, Square counter	02
5	IC 565/4046 application ,calculation of lock range and capture range	02
6	Study of JK flip flop	02
7	A to D & D to A converter using ADC 0808 and DAC 0808	02
8	Study of up down counter & N-modulo counter	02
9	Study of IC 723 as low / high voltage regulator	02
10	IC 7805 used as fixed voltage regulator, elevated voltage and current, constant current source	02

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:-

1.Gaikwad R, “Operational Amplifier”, PHI New Delhi
2.K.R.Botkar, “Integrated Circuit” , Khanna Publication,New Delhi
3.Milman Halkias , “Principles of Electronics”, TMH
4.R P Jain, “Digital Electronics”, TMH.

Network Analysis Lab

Teacher, Paper setter and Examiners should follow the guidelines as given below
Teacher should facilitate learning following lab experiments:

Sr. No.	Title of Experiments	Lab hours required
1	Verifications of Thevenin's Theorem for two port network.	02
2	Verification of Norton's Theorem for two port network.	02
3	Verification of Superposition Theorem for two port network.	02
4	Pole and Zero plot of one port network.	02
5	Measurement of Z parameter of two port network.	02
6	Measurement of Y parameter of two port network.	02
7	Measurement of ABCD parameter of two port network.	02
8	To plot frequency response of series RLC circuit.	02
9	To plot frequency response of parallel RLC circuit.	02
10	Study of Filters.	02

Note: Lab file should consist of minimum **Eight** experiments.

Guide lines for ICA:ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guidelines for ESE:ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of above practical. Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. M.E. Van Valkenberg , "Network Analysis" , Third edition, Printice Hall of India.
2. William Hayt, Jack Kemmerly, "Engineering Circuits Analysis", Fifth editions, McGraw Hill International edition.
3. D. Roy Choudhary, "Networks and Systems", New Age International.
4. Franklin Koo, "Network analysis and Synthesis", New Age International
5. Shyam Mohan and sudhakar, "Network Analysis", TMH Publications.

Electrical Machine-I Lab

Teacher, Paper setter and Examiners should follow the guidelines as given below
Teacher should facilitate learning following lab experiments:

Sr. No	Experiments	Lab Hour required
1	Determination of magnetization, external , internal characteristics and critical field resistance of d. c. shunt generator Draw graph excitation voltage verses field current , find residual voltage and critical resistance. Draw graph showing armature resistance drop, terminal voltage and voltage drop due to armature reactance.	2
2	Determination of external characteristics of d.c. compound generator as i) differential compound, ii) cumulative compound generator. Draw graph showing armature resistance drop , terminal voltage and voltage drop due to armature reactance. Differentiate the characteristic and applications	2
3	Speed control of D.C shunt motor by armature and field control. Obtain the speed above and below normal speed	2
4	i) Study of 3 and 4 point starters. ii) Reversal of motor rotation of D. C. motor. Open the DC motor starters , explanation of each part. Reversing of direction by field as well as armature winding.	2
5	Determination of performance characteristic of DC series motor by direct load test. Observe the speed drop and torque characteristic of DC series motor by plotting the graphs.	2
6	Swinburne's test on DC shunt Motor: Determination of losses & efficiency. Calculation of Efficiency at different percentage of loads for performance of characteristic.	2
7	Polarity test on single phase transformer/ Three phase transformer	2
8	Determination of performance of single phase transformer by Direct loading test. Calculation of losses and efficiency at different percentage of loads.	2
9	Determination of performance of single phase transformer by conducting Open circuit and short circuit test. Draw equivalent circuit and calculation of losses and efficiency at	2

	percentage of loads.	
10	Parallel operation of two single phase transformer. Need and requirement of parallel operation of transformer, its advantages in power system.	2
11	Study of phaser and vector group of three phase transformer.	2
12	Scott connection of two single phase transformer on no load and at balanced load. Draw vector diagram for Scott connection state application.	2

Note: Lab file should consist of minimum EIGHT experiments.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical . Evaluation will be based on paper work and performance in the practical.

Reference Books:

1. E.W.Clayton. "Design and Performance of D.C. Machines"
2. M.G.Say. "Design and Performance of A.C. Machines" CBS Publication
3. Langsdorf, " A.C.Machines," TMH.
4. P.C.Sen. "D.C. Machines", TMH.
5. Nagrath and Kothari "Electric Machine" –TMH
6. B. L. Theraja, "Electrical Technology", Vol – II, S. Chand Publucation
7. P. S Bimbhra, "Electrical Machinery" 2/E, Khanna Publishers
8. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co.

Electrical Installation, Estimation and Distribution

Teacher, Paper setter and Examiners should follow the guidelines as given below
Teacher should facilitate learning following drawing sheets:

Sr. No	Experiments	Lab Hour required
1	Transmission line components : Five insulators –one piece pin, three piece pin type , suspension insulator (one disc) string insulator (one disc), shackle insulator; towers for single circuit and double circuit lines; lightening arrestor, stays, clamps, pin; typical pole including service mains, HT, LT lines supporting pole , 'H' type pole.	6
2	Distribution substation; Two views (front view and side view) of distribution substation layout; single line diagram, pipe earthing, plate earthing.	6
3	Wiring diagrams and symbols**:** minimum 25 symbols as per IS standards. Any one circuit diagram out of the following: 1 Rotor resistance starter, 2) Automatic star /delta starter, 3.Maximum demand indicator,	4
4	Project on illumination design of laboratory / workshop or small scale industrial establishment along with estimation.	4
5	Project on electrification of given area showing distributors, feeders and substations	4

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of drawing sheet and journal.

Guide lines for ESE:-

ESE will be based on oral by the student in the form of drawing sheets and journal. In ESE the student may be asked questions on drawing sheetl. Evaluation will be based answers given by students in oral examination.

Reference Books:

1. J.B.Gupta, "Transmission and Distribution" S.K.Kataria and Sons, New Delhi.
2. S.L.Uppal , "Electrical Wiring , Estimation and Costing" ,Khanna Publishers, New Delhi.
3. V.K.Mehta, "Principle of Power System" ,S.chand, New Delhi
4. S.L.Uppal, "Electric Power", Khanna publishers, New Delhi.
5. H.Pratap , "Art and Science of Electrical Utilization" ,Dhanpat Rai and Sons Pub.
6. B.D.Arora, "Electric Wiring, Estimating and Costing", New Heights, New Delhi
7. S.K.Bhattacharya, "Electrical Estimation and Costing"
8. I.E.Rules