University of Pune
S.E. Electrical Engineering 2012 – Course
(w.e.f. 2013-2014)

SEMESTER – I											
Sr. No.	**Subject Code**	**Subject Title**	**Teaching Scheme**			**Examination Scheme**					**Total Marks**
						Paper		**TW**	**PR**	**OR**	
			Th.	**Pr.**	**Tut.**	**Written**	**Theory Online**				
1.	203141	Power Generation Technologies	04	--	--	50	50	--	--	--	100
2.	207006	Engineering Mathematics-III	04	--	01	50	50	25	--	--	125
3.	203142	Material Science	04	02	--	50	50	--	--	50	150
4.	203143	Analog and Digital Electronics	04	02	--	50	50	25	50	--	175
5.	203144	Electrical Measurements and Instrumentation	04	02	--	50	50	25	50	--	175
6.	203151	Soft Skills	--	02	--	--	--	25	--	--	25
Total			**20**	**08**	**01**	**250**	**250**	**100**	**150**		**750**

SEMESTER – II											
Sr. No.	**Subject Code**	**Subject Title**	**Teaching Scheme**			**Examination Scheme**					**Total Marks**
						Paper		**TW**	**PR**	**OR**	
			Th.	**Pr.**	**Tut.**	**Written**	**Theory Online**				
1.	203145	Power System I	04	--	--	50	50	--	--	--	100
2.	203146	Electrical Machines I	04	02	--	50	50	25	50	--	175
3.	203147	Network analysis	04	02	--	50	50	50	--	--	150
4.	203148	Numerical Methods and Computer Programming	04	02	02	50	50	25	50	--	175
5.	203149	Fundamentals of Microprocessor & Microcontroller	04	02	--	50	50	--	--	50	150
Total			**20**	**08**	**02**	**250**	**250**	**100**	**150**		**750**

203141: POWER GENERATION TECHNOLOGIES

Teaching Scheme
Lectures: 4 Hrs / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online : 50 Marks

Unit 1

Basic thermodynamic cycles: Thermodynamic cycle of steam flow; Rankine cycle; Actual Rankine cycle; Reheat cycle; Carnot cycle, heat rate.

Thermal Power Plants:

Site selection, Main parts and its working. Types of boilers, Feed water and its treatment, Various boiler controls, assessment of heat recovery systems

Fuel Handling: delivery of load, unloading, preparation, transfer, outdoor (dead) storage, indoor (live) storage, In plant Handling, Coal weighing.

Ash disposal and dust collation: Draught systems, electrostatic precipitator

Steam turbines types, selection and control of turbines.

[10 Hrs]

Unit 2

A) Nuclear power plant:

Introduction, atomic physics, nuclear reaction, materials, site selection, nuclear reactors and working of each part, classification of nuclear reactor, nuclear waste disposal, plant layout.

B) Diesel Power Plants:

Main components and its working, Diesel plant efficiency and heat balance, choice and characteristic of diesel power plant. Selection of components and sizing.

C)Gas power plant:

Introduction to gas cycles. Simple gas turbine power plant, methods to improve thermal efficiency, open loop and closed loop cycle power plants, gas fuels, gas turbine materials, plant layout. Combined cycle power plants and concept of heat to power ratio.

[8 Hrs]

Unit 3

Hydro Power Plant

Site selection, Hydrology, storage and pondage, general arrangements and operation of hydro power plant, Hydraulic turbines, turbine size, pelton wheel turbine, Francis and Kaplan turbines, selection of turbines, Dams, Spillways, gates, intake and out take works, canals and layout of penstocks, water hammer and surge tank, simple numerical on hydrographs and number of turbine required. Control of hydro turbines.

[8 Hrs]

Unit 4

Wind Energy Systems

Historical Development of Wind Power, Types of wind turbine electrical generators, Power in the Wind, Impact of Tower Height, Maximum Rotor efficiency, Speed control for Maximum Power, Average Power in the wind, Wind turbine power converters (block diagrams), Wind Turbine Economics, Simple Estimates of Wind Turbine Energy, Environmental Impacts of Wind Turbines. Change in wind pattern and its effect on power generation. Control of wind turbine generator.

[8 Hrs]

Unit 5

Solar Energy

Principles of solar radiations, solar constant, cloudy index and concentration ratio, measurement of solar radiation.

Solar energy collectors (solar thermal applications), principle of energy conversion, collection systems and their features, types of collectors with comparison. Solar thermal power plants.

Over view of recent development of PV technologies. A Generic Photovoltaic Cell, The Simplest Equivalent Circuit for a Photovoltaic Cell From Cells to Modules to Arrays, The PV I–V Curve under Standard Test Conditions (STC), Impacts of Temperature and Insolation on I–V Curves, Shading Impacts on I–V curves, System: Introduction to the Major Photovoltaic System Types.

[8 Hrs]

Unit 6

Other sources and grid connection

Biomass energy, conversion to electricity, municipal solid waste to energy conversion, geothermal energy and ocean energy. Small, mini and micro hydel plants and Fuel cell Energy storage requirements and selection criteria, stand alone, hybrid stand alone and grid connected renewable systems and their requirements.

[6 Hrs]

Industrial visit: Minimum one visit to a generating station is recommended.

Text Books:

1. Power Plant Engineering, by P. K. Nag, Tata McGraw Hill Publications.
2. Power Plant Engineering by Dr. P. C. Sharma, S.K. Kataria Publications.
3. A text book on Power System Engineering,by R.K.Rajput, Laxmi Publications (P) Ltd.
4. A text book on Power System Engineering by Chakrabarti, Soni, Gupta, Bhatnagar, Dhanpat Rai publication
5. Non Conventional Energy Sources and Utilization, by R.K. Rajput, S. Chand Publications
6. Energy Technology, by S.Rao & Dr. Parulkar, Khanna Publishers.
7. Renewable Energy Sources by G. D. Rai, Khanna Publications.

Reference Books:

1) A Course in Power Plant Engineering, by Arora and Domkundwar, Dhapat Rai Publication
2) Solar Energy by Dr. S. P. Sukhatme. Tata McGraw Hill Publication.
3) Wind and Solar Power Plants, by Mukund Patel, CRC Press.

UNIVERSITY OF PUNE

For Electrical + SW / Instrumentation Engineering (Sem I)

207006 ENGINEERING MATHEMATICS – III (2012 Course)

Teaching Scheme:
Lectures – 4 Hrs./Week
Tutorials – 1 Hr./Week

Examination Scheme:
Paper – 50 Marks (2 Hrs.)
Online – 50 Marks
Term work: 25 Marks

Section I

Unit I: Linear Differential Equations (**LDE**) and Applications (09 Hours)

LDE of n^{th} order with constant coefficients, Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous & Symmetric simultaneous DE. Modeling of Electrical circuits.

Unit II: Laplace Transforms (09 Hours)

Definition of LT, Inverse LT, Properties & theorems, LT of standard functions, LT of some special functions viz. Periodic, Unit Step, Unit Impulse. Applications of LT for solving Linear differential equations.

Unit III: Fourier and Z - Transforms (09 Hours)

Fourier Transform (**FT**): Complex exponential form of Fourier series, Fourier integral theorem, Sine & Cosine integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses.

Z - Transform (**ZT**): Introduction, Definition, Standard properties, ZT of standard sequences and their inverses. Solution of difference equations.

Section II

Unit IV: Vector Differential Calculus (09 Hours)

Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit V: Vector Integral Calculus and Applications (09 Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Electro-magnetic fields.

Unit VI: Complex Variables (09 Hours)

Functions of Complex variables, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Cauchy's integral theorem, Cauchy's Integral formula, Laurent's series, Residue theorem.

Text Books:

1. Advanced Engineering Mathematics, 9e, by Erwin Kreyszig (Wiley India).
2. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).

Reference Books:

1. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
2. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
3. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
5. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

Tutorial and Term Work:

i) Tutorial for the subject shall be engaged in minimum of four batches (batch size of 20 students Maximum) per division.

ii) Term work shall consist of six assignments (one per each unit) based on performance and continuous internal assessment.

A S Mujumdar

203142: MATERIAL SCIENCE

Teaching Scheme
Lectures: 4 Hrs. / week
Practical: 2 Hrs. / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online: 50 Marks
Oral: 50 Marks

Unit 1

A) Dielectric Properties of Insulating Materials:

Static Field, Parameters of Dielectric material [Dielectric constant, Dipole moment, Polarization, Polarizability], Introduction to Polar and Non- Polar dielectric materials. Mechanisms of Polarizations-Electronic, Ionic and Orientation Polarization (Descriptive treatment only), Clausius Mossotti Equation, Piezo-Electric, Pyro-Electric & Ferro-Electric Materials, Dielectric Loss and loss Tangent, Concept of negative tan δ.

B) Optical Properties of Materials & Cells used for Power Generation:

Photo-Conductivity, Photo-Electric Emission, Photo-Voltaic cells [Materials Used, Construction, Equivalent Circuit, Working and Application), materials used for Photo-Conductive cells, Photo-Emissive cells.

[8 Hrs]

Unit 2

A) Insulating Materials, Properties & Application:

Introduction, Characteristics of Good Insulating Material, Classification, Solid Insulating Materials-Paper, Press Board, Fibrous Materials, Ceramics, Mica & Asbestos, Resins, Polymers Ceramics, Enamels. Liquid Insulating Materials such as Transformer Oil, Varnish , Askarel, Insulating Gases like Air, SF_6, Insulating Materials for Power & Distribution Transformers, Rotating Machines, Capacitors, Cables, Line Insulators and Switchgears. Crystal defects.

B) Dielectric Breakdown:

Introduction, Concept of Primary and Secondary Ionization of Gases (Descriptive treatment only), Breakdown Voltage, Breakdown Strength, Factors affecting Breakdown Strengths of Gaseous, Liquid and Solid Dielectric Materials.

[8 Hrs]

Unit 3

Magnetic Materials:

Introduction, Parameters of Magnetic material [Permeability, Magnetic Susceptibility, Magnetization], Classification of Magnetic Materials, Diamagnetism, Para magnetism, Ferro-magnetism, Ferri-magnetism, Ferro-magnetic behaviour below Critical Temperature, Spontaneous Magnetization & Curie-Weiss law, Anti-ferromagnetism, Ferrites, Applications of Ferro-magnetic Materials, Magnetic materials for Electric Devices such as Transformer Core , Core of Rotating Machines, Soft Magnetic Materials, Hard Magnetic Materials, Magnetic Recording Materials, Compact Discs**.** Introduction to laser and magnetic strip technology.

[8 Hrs]

Unit 4

Conducting Materials:

General Properties of Conductor, Electrical Conducting Materials - Copper, Aluminum and its applications, Materials of High & Low Resistivity-Constantan, Nickel-Chromium Alloy, Tungsten, Canthal, Silver & Silver alloys, Characteristics of Copper Alloys (Brass & Bronze), Materials used for Lamp Filaments, Transmission Lines, Electrical Carbon Materials, Material used for Solders, Metals & Alloys for different types of Fuses, Thermal Bimetal & Thermocouple. Introduction to Superconductivity and Super Conductors.

[8 Hrs]

Unit 5

Nanotechnology:

Introduction, Concepts of Energy bands & various Conducting Mechanism in Nano-structures, Carbon Nano-structures, Carbon Molecules, Carbon Clusters, Carbon Nano-tubes, Applications of Carbon Nano-tubes, Special Topics in Nano Technology such as Single Electron Transistor, Molecular Machines, BN Nanotubes, Nano wires.

[6 Hrs]

Unit 6

Testing of Materials:

Explanation of following with objectives, equipments required, circuit diagrams and observations to be taken.

1. Measurement of Dielectric Loss Tangent (tan δ) by Schering Bridge-IS 13585-1994.
2. Measurement of Dielectric Strength of Solid Insulating Material-IS 2584.
3. Measurement of tan delta, resistivity and dielectric Strength of Liquid Insulating Material – IS 6798.
4. Measurement of Dielectric Strength of Gaseous Insulating Material –IS 2584.
5. Measurement of Power factor and partial discharge of high voltage cables.
6. Measurement of Flux Density by Gauss-meter.
7. Measurement of dielectric strength of resins and polymers. [8 Hrs]

List of Experiments:

(Any eight experiments from the list below OR six from the following list and remaining two experiments designed and set up by the faculty member will form part of term work.)

1. To measure dielectric strength of solid insulating materials.
2. To measure dielectric strength of liquid insulating materials.
3. To measure dielectric strength of gaseous insulating materials using Sphere Gap-Unit.
4. To obtain Hysteresis Loop of the Ferro-Magnetic Material.
5. To understand the principle of thermocouple & to obtain characteristics of different thermocouples.
6. To measure Insulation Resistance & kVAr capacity of power capacitor.
7. To measure Resistivity of High Resistive Alloys.
8. To observe development of tracks due to ageing on different insulating materials e.g. Bakelite, Perspex, polyesters, Mica, Fiberglass etc.
9. Testing of resins and polymers.
10. Measurement of Tangent of Dielectric Loss Angle (tan δ) of liquid dielectric materials.
11. Measurement of Flux Density by Gauss-meter.

Industrial Visits: Minimum one visit should be arranged to an industry related to material science. A hand written report should be submitted by every student as a part of term work.

Text Books:

1. A Course in Electrical Engineering Materials, by S. P. Seth, Dhanpat Rai and Sons publication.
2. Electrical Engineering Materials, T.T.T.I, Madras.
3. Electrical Engineering Materials, by K. B. Raina & S. K. Bhattacharya, S. K. Kataria & Sons.
4. Material Science for Electrical Engineering, by P.K. Palanisamy, Scitech Pub.(India) Pvt. Ltd., Chennai.

Reference Books:

1. Electrical Power Capacitors-Design & Manufacture, by D. M. Tagare, Tata McGraw Hill Publication.
2. Electrical Engineering Materials, by S. P. Chalotra & B. K. Bhatt, Khanna Publishers, Nath Market.
3. Electrical Engineering Materials, by C. S. Indulkar & S. Thiruvengadam, S. Chand & Com.Ltd,
4. High voltage engg. by Kamraju & Naidu, Tata McGraw Hill Publication.
5. Introduction to Material Science for Engineering, Sixth Edition by James F. Shackelford & M. K. Muralidhara, Pearson Education.
6. Insulation Technology Course Material of IEEMA Ratner, Pearson Education
7. Introduction to Nanotechnology by Charles P. Poole, Jr. Frank & J. Ownes (Wiley Student Edition)
8. Materials Science for engineering students, by Traugott Fischer, Elsevier publications.

203143: ANALOG AND DIGITAL ELECTRONICS

Teaching Scheme
Lectures: 4 Hrs / week
Practical: 2 Hrs / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online: 50 Marks
Practical: 50 Marks
Term Work: 25 Marks

Unit 1

Numbering systems-binary, octal, decimal and hexadecimal and their conversion, codes-BCD, Grey and excess3, Binary arithmetic:- addition and subtraction by 1's and 2's compliment. Booleans algebra, De-Morgan's theory etc. K-map: - structure for two, three and four variables, SOP and POS form reduction of Boolean expressions by K-map.

[7 Hrs]

Unit 2

Concept of Combinational & Sequential circuits, Flip flops – R-S, Clocked S-R, D latches, Edge triggered D flip-flops, Edge triggered JK flip flops, JK Master - slave flip flop, Register-Buffer registers, shift registers, controlled shift registers, ring counter, Counters - asynchronous counters, synchronous counter, up-down counter, twisted ring counters, N - module counters.

[8 Hrs]

Unit 3

Op-Amp: Block diagrams of 741 and 324, ideal and practical parameters open loop and close loop configuration of Op-Amp. Applications of Op- Amp- Comparator, Schmitt trigger, zero crossing detectors, V-I and I-V converters, voltage regulators using ICs 78xx, 79xx, LM 317 and LM 723.

[9 Hrs]

Unit 4

Waveform generation using Op-amp - sine, square, saw tooth and triangular generator, peak detector, Instrumentation amplifier, Half and full wave precision rectifiers IC 555 – construction, working and modes of operation- astable, monostable and multivibrators, Sequence generator, Active filters-Its configuration with frequency response, Analysis of first order low pass and high pass filters.

[7 Hrs]

Unit 5

BJT amplifier: Introduction, Class A amplifier, AC-DC load line analysis, Single stage and Multistage BJT amplifier, direct coupled, RC coupled and transformer coupled, Darlington pair, Push-Pull amplifier and differential amplifier FET-construction, Parameters, Characteristics.

[8 Hrs]

Unit 6

Diode Rectifiers: Introduction, Single phase half wave rectifier with R, RL and RC loads. Single phase full wave rectifier – Center tap and bridge rectifier supplying R and RL load and performance parameters. Three phase full wave bridge rectifier with R and RL load. Comparison of single phase half wave and full wave rectifiers, comparison of single phase full wave bridge and three phase full wave bridge rectifiers. Consideration of LC filters.

[9 Hrs]

Total ten experiments are to be conducted of following experiments
First seven experiments are compulsory.

1. Study of counters, ring counter and twisted ring counter.
2. Study of up - down counters (IC 74192/74193) and N- modulo counter. (IC 7490/7493).
3. Op-amp as ZCD, Comparator and Schmitt trigger.
4. Instrumentation amplifier using 3 - op amp CMR measurement and precision rectifier.
5. Op-amp as sine, saw-tooth and triangular wave generator.
6. IC-555 applications- astable, monostable, sequence counter.
7. Study of Single Phase Full-wave bridge rectifier with RL load.

Any Three experiments are to be conducted of following experiments:

1. Study of Three Phase Full-wave Rectifier with RL.
2. Study of active filters- Low pass and high pass filters.
3. Transistor amplifiers: frequency response of BJT, multistage BJT amplifier and FET amplifier.
4. Study of Single Phase Half-Wave Rectifier.
5. Study of various flip-flops and verification of truth table.
6. Study and verify shift register operation (IC 7495).
7. Voltage regulation of IC VR 78xx, 79xx and LM317.

Text Books:

1. Fundamentals of Logic Design Jr. Forth Edition by Charles H. Roth, A Jaico Book.
2. Digital Computer Electronics - An Introduction to Microcomputers, by Malvino Tata McGraw Hill.
3. Electronics Devices & Circuits, by Mottershed, PHI New Delhi.
4. Digital Electronics, by R. P. Jain, Tata McGraw Hill, New Delhi.
5. Digital Electronics-Principles and Application, 6th edition, by Tokheim Tata McGraw Hill, New Delhi.
6. Power Electronics: Circuits, Devices and Applications 3rd edition, by Muhammad H. Rashid, Pearsons Education.

References Books:

1. Operational Amplifier, by Gaikwad R. PHI New Delhi.
2. Integrated Circuits, by K. R. Botkar, Khanna Publication, New Delhi.
3. Operational Amplifier and Linear Integrated Circuits Theory and Application by James.

203144: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Teaching Scheme
Lectures: 4 Hrs. / week
Practical: 2 Hrs. / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online: 50 Marks
Practical: 50 Marks
Term Work : 25 Marks

Unit 1

A) **Classification of Measuring Instruments** - Characteristics of measuring instruments: Static and dynamic, accuracy, linearity, speed of response, dead zone, repeatability, resolution, span, reproducibility, drifts. Necessity of calibration, Absolute and secondary instruments, types of secondary instruments: indicating, integrating, and recording, analog / digital.

Ammeter and Voltmeter theory: Essentials of indicating instruments deflecting, controlling and damping systems. Construction, working principle, torque equation, advantages and disadvantages of Moving Iron (MI) (attraction and repulsion), and Permanent Magnet Moving Coil (PMMC).

B) **Range Extension:** PMMC ammeters and voltmeters using shunts, multipliers. Universal shunt, Universal multiplier. Instrument Transformers: Construction, connection of CT & PT in the circuit, advantages of CT / PT over shunt and multipliers for range extension of MI Instruments, transformation ratio, turns ratio, nominal ratio, burden, ratio and phase angle error.(Descriptive treatment only)

[8 Hrs]

Unit 2

A) **Measurement of Resistance:** Measurement of low, medium and high resistance. Wheatstone bridge, Kelvin's Double Bridge, Ammeter-Voltmeter method, Megger, Earth tester for earth resistance measurement.

B) **Measurement of Inductance:** Introduction, sources and detectors for a.c. bridge, general equation for bridge at balance. Measurement of Inductance: Maxwell's Inductance & Maxwell's Inductance – Capacitance Bridge, Anderson's Bridge.

[8 Hrs]

Unit 3

Measurement of Power: Construction, working principle, torque equation, errors and their compensation, advantages/disadvantages of dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method. Power analyzer, TOD meter, multi meter.

[8 Hrs]

Unit 4

Measurement of Energy: Construction, working principle, torque equation, errors and adjustments of single phase conventional (induction type) energy meter, Calibration of energy meter. Block diagram and operation of electronic energy meter. Three phase energy meters.

[8 Hrs]

Unit 5

A) Oscilloscope: Introduction, various parts, front panel controls, use of CRO for measurement of voltage, current, period, frequency, phase angle & frequency by lissajous pattern & Numerical.

B) Transducers: Introduction, classification, basic requirements for transducers. Pressure measurement: Introduction, classification of pressure as low / medium / high, absolute / gauge / vacuum, static / dynamic & head pressure. High pressure measurement using electric methods, low pressure measurement by McLeod gauge and pirani gauge, capacitive pressure transducer.

[8 Hrs]

Unit 6

A) **Level measurement:** Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, electrical, nucleonic and ultrasonic.

B) **Displacement measurement:** LVDT & RVDT – construction, working, application, null voltage, specifications, advantages / disadvantages, effect of frequency on performance. Strain Gauge: Introduction, definition of strain, types of strain gauge: Wire strain gauge, foil strain gauge, semiconductor strain gauge etc; their construction, working, advantages and disadvantages. [8 Hrs]

Industrial Visit: Minimum one visit should be arranged to electrical instrument manufacturing company or where electrical instruments are calibrated or where various measuring instruments (Electrical/Mechanical) can be seen or observed.

List of Experiments:

The term work shall consist of any **10** experiments from list below, out of which **first five** experiments are **compulsory.**

1. Demonstration of working parts of various types of meter by opening the instrument & explanation of symbols & notations used on instruments.
2. Measurement of Active & reactive power in three phase circuit using two wattmeter method (Balanced & Unbalanced Loads).
3. Extension of instrument range: ammeter, voltmeter, watt meter using CT PT.
4. Calibration of Single phase static energy meter at different power factors. (Electronic Energy Meter).
5. Measurement of Active & Reactive power in three phase balanced circuit using one wattmeter method with two way switch.
6. Measurement of power in three phase four wire using three CTs and Two wattmeter.
7. Measurement of Reactive Power by one wattmeter with all possible connections of current coil and pressure coil.
8. Calibration of Voltmeter & Ammeter.
9. Calibration of Single phase wattmeter at different power factors.
10. i) Measurement of resistance by ammeter voltmeter method.
    ii) Measurement of voltage, current, time period & frequency using CRO & frequency measurement by lissajous pattern.
11. i) Measurement of Low resistance using Kelvin's Double Bridge.
    ii) Measurement of inductance using Anderson's Bridge/ Maxwell's Bridge.
12. i) Displacement measurement by LVDT.
    ii) Electrical methods for measurement of liquid level.

Text Books:

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhney, Dhanpat Rai & Sons.
2. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.
3. Instrumentation: Measurement and Analysis, Sixth Reprint by Nakra & Chaudhari, Tata McGraw Hill, New Delhi.
4. Mechanical and Industrial Measurements by R. K. Jain, Khanna Publishers, New Delhi.

Reference Books:

1. Electrical Measurement & Measuring Instruments, Fifth edition, by E. W. Golding & Widdies, A. H. Wheeler & Co. Ltd.
2. Electonic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and Instrumentation, Second Edition by Ghosh, PHI Publication.
4. Introduction to Measurements and Instrumentation by Anand, PHI Publication.

203151: SOFT SKILLS

Teaching scheme | **Examination Scheme**
Practical: 2 Hrs/week | Term work: 25 marks

SECTION – I

UNIT I:
Self Awareness & self Development –
a) Self Assessment , Self Appraisal, SWOT, Goal setting - Personal & career - Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self appraisal, Personal Goal setting,
b) Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, prioritization. **(04 Hrs)**

UNIT II: Communication Skill
a) Importance of communication, types, barriers of communication, effective communication
b) Speaking Skills – Public Speaking, Presentation skills, Group discussion- Importance of speaking effectively, speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self expression, body language phonetics and spoken English, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, positive image projection techniques.
c) Listening Skills: Law of nature- you have 2 ears and 1 tongue so listen twice and speak once is the best policy, Empathic listening, Avoid selective listening-
d) Group Discussion - characteristics, subject knowledge, oral and leadership skills, team management, strategies and individual contribution and consistency.
e) Presentation skills - planning, preparation, organization, delivery.
f) Written Skills – Formal & Informal letter writing, Report writing, Resume writing - Sentence structure, sentence coherence, emphasis. Paragraph writing. letter writing skills - form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters,
Routine business letters, Sales Letters etc. **(06 Hrs)**

UNIT III: Corporate / Business Etiquettes
Corporate grooming & dressing, Email & telephone etiquettes, etiquettes in social & office setting-Understand the importance of professional behaviour at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Body language, Meeting etiquettes (targeted at young professionals who are just entering business environment) , Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities, **(02 Hrs)**

UNIT IV: Interpersonal relationship
a) Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity
b) Group Discussion- Preparation for a GD, Introduction and definitions of a GD, Purpose of a GD, Types of GD, Strategies in a GD , Conflict management, Do's and Don'ts in GD **(04 Hrs)**

UNIT V: Leadership skills

Leaders' role, responsibilities and skill required - Understanding good Leadership behaviours, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback **(02 Hrs)**

UNIT VI: Other skills

a) Time management- The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritise using decision matrices, to beat the most common time wasters, how to plan ahead, how to handle interruptions , to maximise your personal effectiveness, how to say "no" to time wasters, develop your own individualised plan of action

b) Stress management- understanding the stress & its impact, techniques of handling stress

c) Problem solving skill, Confidence building Problem solving skill, Confidence building **(02 Hrs)**

Term Work/Assignments

Term work will consist the record of any 8 assignments of following exercises

1. SWOT analysis
2. Personal & Career Goal setting – Short term & Long term
3 Presentation Skill
4. Letter/Application writing
5. Report writing
6. Listening skills
7. Group discussion
8. Resume writing
9. Public Speaking
10. Stress management
11. Team Activity-- Use of Language laboratory

*** Perform any 8 exercises out of above 11 with exercise no. 11 as compulsory.**

Teaching Methodology

Each class should be divided into three batches of 20-25 students each. The sessions should be activity based and should give students adequate opportunity to participate actively in each activity. Teachers and students must communicate only in English during the session. Specific details about the teaching methodology have been explained in every activity given below.

Practical Assignments (Term work)

Minimum 8 assignments are compulsory and teachers must complete them during the practical sessions within the semester. The teacher should explain the topics mentioned in the syllabus during the practical sessions followed by the actual demonstration of the exercises. . Students will submit report of their exercise (minimum 8) assignments as their term work at the end of the semester but it should be noted that the teacher should assess their assignment as soon as an activity is conducted. The continual assessment process should be followed.

1. **SWOT analysis**

The students should be made aware of their goals, strengths and weaknesses, attitude, moral values, self confidence, etiquettes, non-verbal skills, achievements etc. through this activity. The teacher should explain to them on how to set goals, SWOT Analysis, Confidence improvement, values, positive attitude, positive thinking and self esteem. The teacher should prepare a questionnaire which evaluate students in all the above areas and make them aware about these aspects.

2. **Personal & Career Goal setting – Short term & Long term**

3 **Presentation Skills**

Students should make a presentation on any informative topic of their choice. The topic may be technical or non-technical. The teacher should guide them on effective presentation skills. Each student should make a presentation for at least 10 minutes.

4**. Letter/Application writing**

Each student will write one formal letter, and one application. The teacher should teach the students how to write the letter and application. The teacher should give proper format and layouts.

5. **Report writing**

The teacher should teach the students how to write report .. The teacher should give proper format and layouts. Each student will write one report based on visit / project / business proposal etc.

6**. Listening skills**

The batch can be divided into pairs. Each pair will be given an article (any topic) by the teacher. Each pair would come on the stage and read aloud the article one by one. After reading by each pair, the other students will be asked questions on the article by the readers. Students will get marks for correct answers and also for their reading skills. This will evaluate their reading and listening skills. The teacher should give them guidelines on improving their reading and listening skills. The teacher should also give passages on various topics to students for evaluating their reading comprehension.

7. **Group discussion**

Each batch is divided into two groups of 12 to 14 students each. Two rounds of a GD for each group should be conducted and teacher should give them feedback.

8. **Resume writing**

Each student will write one formal letter, and one application. The teacher should teach the students how to write the letter and application. The teacher should give proper format and layouts.

9. **Public Speaking**

Any one of the following activities may be conducted :

a. **Prepared speech** (topics are given in advance, students get 10 minutes to prepare the speech and 5 minutes to deliver.
b. **Extempore speech (**students deliver speeches spontaneously for 5 minutes each on a given topic)
c. **Story telling (Each student narrates a fictional or real life story for 5 minutes each)**
d. **Oral review** (Each student orally presents a review on a story or a book read by them)

10.. **Team Activity**-- Use of Language laboratory

Text Books:

1 Communication Skills : Sanjay Kumar and Pushpa Lata , Oxford University Press

2 Developing Communication Skill : Krishna Mohan, Meera Banerji,- McMillan India Ltd.

3 English for Business Communication : Simon Sweeney , Cambridge University Press

Books for references:

1.NASSCOM-Global Business Foudation Skills: Accenture,Convergys,Dell et.al. Foundation Books : Cambridge University Press

2. Basic Managerial Skills for all E. H. McGrath, Eastern Economy Edition, Prentice hall India.

3. Personality Development and Group Discussions,Barun K. Mitra, Oxford University Press

4 Group Dissussions and Interview Skills : Priyadarshi Patnaik : Foundation Books : Cambridge University Press

5.Thinks and Grow Rich: Napoleon Hill, Ebury Publishing, ISBN 9781407029252

6. Awaken the Giant Within: Tony Robbins HarperCollins Publishers, ISBN-139780743409384

7. Change Your Thoughts, Change Your Life: Wayne Dyer, Hay House India, ISBN-139788189988050

8 Habits of Highly Effective People: Stephen Covey Pocket Books, ISBN-13 9781416502494

9The Power of Your Subconscious Mind: Dr Joseph Murphy Maanu Graphics , ISBN-13 9789381529560

10- The new Leaders: Daniel Coleman Sphere Books Ltd , ISBN-139780751533811

11 The 80/20 Principal: by Richard Koch, Nicholas Brealey Publishings , ISBN-13 9781857883992

12 Time management from inside out: Julie Morgenstern, Owl Books (NY), ISBN-13 9780805075908

13.Wonderland of Indian Manageress: Sharu Ranganekar, Vikas Publishing Houses, ISBN-13 9788125942603

14. You can win: Shiv Khera, Macmillan, ISBN-139789350591932

15. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: **Gopalaswamy Ramesh**, **Mahadevan Ramesh**

203145: POWER SYSTEMS –I

Teaching scheme:
Lectures: 4 Hrs. /week

Examination Scheme:
Written: 50 Marks [2 Hrs]
Online: 50 Marks

Unit 1

A) Structure of Electrical Power Systems:

Structure of Electrical Power System**,** Load curve, load duration curve, different factors associated with generating stations such as load factor, demand factor, diversity factor, plant capacity factor, annual plant use factor, concept of base load and peak load stations, interconnected grid system. Fitting of available generating stations into the area load duration curve, choice of size and number of generator units.

B) Tariff :

Introduction of Tariff, Tariff setting principles, desirable characteristics of Tariff, residential, commercial, Flat rate, two part, three part, Time of Day tariff for H.T. & L.T. industrial consumers along with current electricity charges, Introduction to Availability Based Tariff (ABT), Interruptible tariff, Incentives and penalties.

[8 Hrs]

Unit 2

A) Major Electrical equipments in Power Stations : Descriptive treatment of ratings of various equipments used in power station, Special features, field of use of equipments like alternators, transformers, bus-bars, exciters and excitation systems, voltage regulators, switches, isolators, reactors, carrier current equipments (P.L.C.C.), Control panels, metering and other control room equipments in generating stations.

B) Overhead line insulators: Types of insulators & their applications, pin type, suspension type, strain type insulators, Silicon Rubber insulators, post insulators, bushings, voltage distribution along string of suspension insulators, string efficiency, equalization of potential across each unit.

[8 Hrs]

Unit 3

A) Mechanical design of overhead lines: Line supports, spacing between the conductors, length of span, calculation of sag, equal and unequal supports and effect of ice and wind loadings.

B) Underground Cables: Classification, Construction of cable, XLPE cables, insulation resistance, capacitance, dielectric stress in single core/multi core cables, cables for HVDC transmission. Cable faults and methods for location of faults.

[8 Hrs]

Unit 4 Resistance and Inductance of Transmission lines:

Resistance of line, skin effect and its effects, proximity effect, internal & external flux linkages of one conductor of one group, inductance of single phase two wire line, inductance of composite conductor line, concept of G.M.R. and G.M.D., inductance of three phase line with equilateral spacing, inductance of parallel circuit three phase line, Bundled conductors, Inductance of three phase line with equilateral spacing, horizontal spacing, unsymmetrical spacing, double circuit three phase line, Calculation of inductance to be done with and without transposition.

[8 Hrs]

Unit 5 Capacitance of Transmission lines:

Concept of G.M.R. and G.M.D for capacitance calculations, capacitance of single phase line with earth effect and without effect of earth's surface on electric field, capacitance of three phase line with equilateral spacing, capacitance of parallel circuit three phase line with equilateral spacing, unsymmetrical spacing, double circuit three phase line, calculation of capacitance to be done with and without transposition.

[8 Hrs]

Unit 6 Performance of Transmission lines:

Classification of lines based on length as short, medium and long lines. Ferranti effect, Representation of lines as 'Pi' and 'Tee' circuits using R, L and C parameters, voltage and current relations for short and medium lines only. Representation of 'Tee' and 'Pi' models of lines as two port networks, phasor diagrams, evaluation and estimation of ABCD constants for both the models, Estimation of Efficiency & regulation of short & medium lines.

[8 Hrs]

Industrial visit: Minimum one visit to HV/EHV substations is recommended.

Text Books:

1. Power System Analysis by W.D. Stevenson, Tata McGraw Hill Publications.
2. Power System Analysis & Design 4th Reprint, by B.R.Gupta, S.Chand Publishing Co.
3. A text book on Power System Engineering by A Chakraborty, M.L.Soni, P.V.Gupta, U.S. Bhatnagar, Dhanpat rai & Co., Delhi.
4. Transmission and Distribution by J.B. Gupta, S.K.Kataria & Sons, New Delhi.
5. Electric Power Generation, Transmission and Distribution by S.N.Singh, Prentice Hall of India.

Reference Books:

1. Elements of Power Station Design by M.V. Deshpande, Wheeler Publishing.
2. Modern Power System Analysis by I.J. Nagrath and D.P.Kothari, Tata Mc Graw Hill Publications.
3. Generation and Economic Considerations by J.B.Gupta, S.K.Kataria & Sons, New Delhi.
4. Power System Engineering by Nagrath & Kothari, Tata McGraw Hill Publications.
5. Electrical Power System by D. Das, New Age Publication.
6. Know your Power – citizen's primer – Prayas Energy group
7. www.mahadiscom.in
8. www.mercindia.org.in

203146: ELECTRICAL MACHINES I

Teaching Scheme
Lectures: 4 Hrs. /Week
Practical: 2 Hrs. /Week

Examination Scheme
Written: 50 Marks[2 Hrs]
Online: 50 Marks
Term Work: 25 Marks
Practical: 50 Marks

Unit 1
Transformers
Single phase Transformer: Concept of ideal transformer. Corrugated core transformer. Useful and leakage flux, its effects. Resistance, leakage reactance and leakage impedance of transformer windings & their effects on voltage regulation and efficiency. Exact and approximate equivalent circuits referred to L.V. and H. V. side of the transformer. Phasor diagrams for no-load and on load conditions. Transformer ratings. Losses in a transformer, their variation with load. Efficiency and condition for maximum efficiency. Open circuit and short circuit tests, determination of equivalent circuit parameters from the test data and determination of voltage regulation and efficiency. Autotransformers, their ratings and applications. Comparison with two winding transformer with respect to saving of copper and size.

[8 Hrs]

Unit 2
Transformers
Polarity test. Parallel operation of single phase transformers, conditions to be satisfied, load sharing under various conditions.
Three phase transformers: Standard connections of three phase transformers and their suitability for various applications, voltage phasor diagrams and vector groups.
Descriptive treatment of Parallel operation of three phase transformers Scott connection and V connections. Three winding (tertiary windings) transformers

[6 Hrs]

Unit 3
D.C. Machines
Construction, main parts, magnetic circuits, poles, yoke, field winding, armature core, Armature windings : Simple lap and wave winding, commutator and brush assembly. Generating action, e.m.f equation, magnetization curve, motoring action. Types of DC motors, significance of back e.m.f. torque equation, working at no-load and on-load. Losses, power flow diagram and efficiency. Descriptive treatment of armature reaction.

[8 Hrs]

Unit 4
Characteristics and applications of D.C. Shunt and Series Motors, Starting of DC motors, study of starters for series and shunt motor, solid state starters, speed control of various types of DC motors.
Commutation: Process of commutation, time of commutation, reactance voltage, straight line commutation, commutation with variable current density , under and over commutation, causes of bad commutation and remedies, inter poles, compensating windings. (Descriptive treatment only)

[8 Hrs]

Unit 5

Three phase induction motor

Production of rotating mmf by 3-phase balanced voltage fed to a symmetrical 3-phase winding. Construction : Stator and its 3-phase windings. Types of rotors: Squirrel cage & wound rotors. Principle of working, simplified theory with constant air gap flux; slip, frequency of rotor emf and rotor currents, mmf produced by rotor currents, its speed w.r.t. rotor and stator mmf. Production of torque, torque-slip relation, condition for maximum torque, torque-slip Characteristics, effect of rotor resistance on torque-slip characteristics. Relation between starting torque, full load torque and maximum torque.

Losses in three phase induction motor, power-flow diagram. Relation between rotor input power, rotor copper loss & gross mechanical power developed, efficiency.

[8 Hrs]

Unit 6

Induction motor as a generalized transformer; phasor diagram. Exact & approximate equivalent circuit. No load and blocked rotor tests to determine the equivalent circuit parameters and plotting the circle diagram. Computation of performance characteristics from the equivalent circuit and circle diagram. Performance curves.

Necessity of starter for 3-phase induction motors. Starters for slip-ring and cage rotor induction motors; stator resistance starter, auto transformer starter, star delta starter and rotor resistance starter. D.O.L. starter and soft starting, with their relevant torque and current relations. Comparison of various starters. , testing of three phase induction motor as per IS 325 & IS 4029.

[6 Hrs]

Industrial Visit:-

Minimum One visit to above machines manufacturing industry is recommended.

List of Experiments :

Note: First three experiments on transformer are compulsory, any two on D.C. machines and three on Induction motors. Report on industrial visit.

1. O.C. and S.C. test on single phase Transformer.
2. Polarity test on single phase and three phase transformer.
3. Parallel operation of two single phase transformers and study of their load sharing under various conditions of voltage ratios and leakage impedances.
4. Speed control of D.C. Shunt motor and study of starters
5. Brake test on D.C. Shunt motor
6. Load characteristics of D.C. series motor.
7. Hopkinson’s test on D.C. shunts machines.
8. Load test on 3-phase induction motor.
9. No load & blocked-rotor test on 3-phase induction motor :
    a. Determination of parameters of equivalent circuit
    b. Plotting of circle diagram.
10. Calculation of motor performance from (a) & (b) above.

Text Books:

1. Electrical Technology by Edward Hughes ELBS, Pearson Education.
2. Electrical Machines by Ashfaq Husain, Dhanpat Rai & Sons
3. Electrical Machine 2nd Edition by S. K. Bhattacharya, Tata Mc Graw Hill publishing Co. Ltd.
4. Electrical Machines by Nagrath & Kothari, Tata Mc Graw Hill.
5. Electrical Machines by Bhag S Guru, Husein R. Hiziroglu, Oxford University Press.
6. Electrical Machines- I and II, by K Krishna Reddy**,** SCITECH Publications (India) Pvt. Ltd. Chennai.

Reference Books:

1. Performance and Design of Direct Current Machines Third Edition by A.E.Clayton and N.N. Hancock, CBS Publishers.
2. Electrical Machines Fifth Edition by A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans Tata Mc Graw Hill Publication Ltd.
3. Theory and performance of DC machines by A.S. Langsdorf, Tata Mc Graw Hill.
4. Theory and Performance of AC machines by A.S. Langsdorf, Tata Mc Graw Hill.
5. Performance and Design of AC. Machines by M.G. Say CBS Publishers and Distributors.
6. Electrical Machines by Smarajit Ghosh , Pearson Education, New Delhi.
   Electrical Machines Theory, Application, & Control, Second Edition by Charles I Hubert, Pearson Education, New Delhi.

203147: NETWORK ANALYSIS

Teaching Scheme
Lectures: 4 Hrs. / week
Practical: 2 Hrs. / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online: 50 Marks
Term work: 50 Marks

Unit 1
Types of Networks: Lumped and Distributed, Linear and Nonlinear, Bilateral and Unilateral, Time-variant and Time-invariant. Independent and Dependent (controlled) voltage and current sources. Concept of voltage and current divider, Source transformation and shifting. Network Equations: Network equations on Loop basis and Node basis, choice between Loop analysis and Nodal analysis. Concept of super node and super mesh, mutual inductance, Dot convention for coupled circuits, Concept of duality and dual networks.

[7 Hrs]

Unit 2
Superposition, Thevenin, Norton, Maximum Power Transfer Theorem, Reciprocity, Millman theorems applied to electrical networks with all types of sources.

[7 Hrs]

Unit 3
Solutions of differential equations and network equations using classical method for R-L, R-C and R-L-C circuits, Initial and Final Condition (series and parallel).

[8 Hrs]

Unit 4
Basic Properties of Laplace Transform, Laplace Transform of Basic R, L and C components, Solutions of differential equations and network equations using Laplace transform method for R-L, R-C and R-L-C circuits (series and parallel), Inverse Laplace transforms, transformed networks with initial conditions. Analysis of electrical circuits with applications of step, pulse, impulse & ramp functions, shifted & singular functions the convolution integral. Laplace transforms various periodic and non periodic waveforms application of Laplace transforms.

[9 Hrs]

Unit 5
Two Port Network: Z, Y, H and transmission parameters, Interrelations between parameters. Input power, Power transfer and Insertion loss: Energy and power, Effective or Root-Mean – Square values, Average power and complex power, Problems in Optimizing power transfer, Insertion Loss. Introduction to passive filters, low pass filters, high pass filters and m-derived LPF and HPF filters and design.

[8 Hrs]

Unit 6
Network Functions: Poles and Zeros: Terminal pairs or ports, network functions for the one port and two ports, the calculation of network functions, general networks. Poles and zeros of network functions, Restrictions on poles and zeros locations for transfer functions and driving point function, Time –domain behaviour from the pole and zero plot. Stability of active networks.
Parallel Resonance, Resonance frequency, Quality factor, Current and resonance.

[9 Hrs]

List of Experiments:

Any four experiments from the first five of the following and any four experiments from rest of the list. (Minimum four experiments should be based on simulation software PSPICE/MATLAB along with hardware verification)

1. Verification of Superposition theorem in A.C. circuits.
2. Verification of Thevenin's theorem in A.C. circuits.
3. Verification of Reciprocity theorem in A.C. circuits.
4. Verification of Millmans' theorem.
5. Verification of Maximum Power Transfer theorem in A.C. circuits.
6. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor)
7. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit)
8. Determination of time response of R-L-C series circuit to a step D.C. voltage input.
9. Determination of parameter of Two Port Network.
10. Determination of Resonance of R-L-C Parallel circuit
11. Determination of Resonance, Bandwidth and Q factor of R-L-C series circuit.

Text Book:

1. Network Analysis Third Edition by M. E. Van Valkenburg, Prentice Hall of India Private Limited.
2. Network Theory Second Edition by N. C. Jagan, C. Lakshminarayana, BSP Publication.
3. Network Analysis & Synthesis by G. K. Mittal, Khanna Publication.
4. Introduction to Electric Circuits Sixth Edition by Richard C. Dirof, James A. Svoboda,Wiley.
5. Introduction to Electric Circuits by Alexander & Sadiku, McGraw Hill.
6. Introduction to Electric Circuits by S. Charkarboorty, Dhanpat Rai & Co.
7. Fundamentals of Electrical Networks by B.R.Gupta & Vandana Singhal- S.Chand Publications
8. Electrical Circuit Analysis 2nd Edition by P. Ramesh babu, Scitech Publication India Pvt Ltd.

Reference Books:

1. Network Analysis by Cramer McGraw Hill Publication.
2. Engineering Circuit Analysis by William H. Hayt, Jr. Jack E. Kemmerly, McGraw Hill Publication.
3. Electric Circuits and Networks by K.S. Suresh Kumar, Pearson Education
4. Network Analysis Second Edition, by N.C. Jagan, BS Publication, Hyderabad

203148: NUMERICAL METHODS AND COMPUTER PROGRAMMING

Teaching Scheme
Theory: 4 Hrs. /Week
Practical: 2 Hrs. /week
Tutorial: 2 Hr. /week

Examination Scheme
Written: 50 Marks[2 Hrs]
Online: 50 Marks
Practical: 50 Marks
Termwork: 25 Marks

Unit 1
Basic of 'C' Language
Revision: Basics of 'C' language - Data types, Operator precedence.
Control statements: 'if-else' and nested 'if-else', 'for, while and do-while'.
Arrays: Introduction, one and two dimensional arrays.
Functions: Function declaration and prototypes, Local and Global variables, Types of functions – call by value, call by reference.
Pointers: Introduction, declaring and initializing pointers, pointer expressions, pointer and arrays, pointers and functions

[8 Hrs]

Unit 2
A) Basic principle of numerical methods and necessity of computers for high speed calculations. Floating point algebra with normalized floating point technique, Significant digits. **Errors**: Different types of errors, causes of occurrence and remedies to minimize them. Numerical instability in computations.
B) **Concept of roots** of an equation and methods to find the same. Descartes' rule of signs, Sturm's theorem, Intermediate value theorem. Synthetic division, Roots of Polynomial Equations using Birge-Vieta method.

[8 Hrs]

Unit 3
A) **Solution of Transcendental and polynomial equation :**
Bisection, Secant, Regula-Falsi, Chebyshev and Newton-Raphson methods, Newton-Raphson method for two variables.
B) **Curve Fitting** using least square approximation – First order and second order.

[8 Hrs]

Unit 4
A) **Interpolation:** Difference operators, Introduction to interpolation - Newton's forward, backward interpolation formulae, Stirling's and Bessel's central difference formulae, Newton's divided difference formula, Lagrange's interpolation.
B) **Numerical Differentiation** using Newton's forward and backward interpolation formulae.

[8 Hrs]

Unit 5
A) Solution of simultaneous equation: Direct methods - Gauss and Gauss-Jordan elimination methods, concept of pivoting – partial and complete. Iterative methods – Jacobi and Gauss Seidel methods.
B) Matrix Inversion using Jordon method and Eigen values using Power method and Jacobi methods

[8 Hrs]

Unit 6

A) **Solution of First order Ordinary Differential Equation(ODE)** using Taylor's series method, Euler's, Modified Euler's methods. Runge-Kutta second and fourth order methods. **Solution of Second order ODE** using 4th order Runge-Kutta method.

B) **Numerical Integration:** Trapezoidal and Simpson's rules as special cases of Newton-Cote's quadrature technique for single and double integrals

[8 Hrs]

List of Experiments:

Term work shall consist of minimum NINE computer programs in C / C++ language with flow charts and results.

Following ***FIVE*** experiments are compulsory –

1. Solution of two variable non-linear equation using N-R method.
2. Solution of second order ODE using 4^{th} order RK method.
3. Solution of Numerical Integration using Simpson's (1/3)rd or (3/8)th rule
4. Solution of simultaneous equation using Gauss Seidel or Jacobi method
5. To find eigen values and vector using Jacobi method

Perform ***any FOUR*** experiments from following -

1. Solution of a polynomial equation using Birge-Vieta method
2. Solution of a transcendental equation using Bisection or Regula-falsi method
3. Program for interpolation using Newton's forward or backward interpolation
4. Program for interpolation using Lagrange's or Newton's Divided difference interpolation
5. Second order curve fitting using Least square approximation
6. Solution of first order ODE using 4^{th} order RK method.
7. Solution of simultaneous equation using Gauss elimination or Jordon method
8. Program for partial pivoting of the given matrix
9. Matrix inversion using Jordon method.

Tutorials:

Tutorials should be based on following methods, considering their practical applications.

1. Introduction to 'C' programming.
2. Sturm's Theorem
3. Birge Vieta method
4. Regula Falsi method
5. Newton Raphson method
6. Stirling's interpolation method
7. Newton's Divided Difference Interpolation method
8. Second order Least Square Approximation method
9. Gauss Elimination and Gauss Jordan methods with partial pivoting
10. Jacobi and Gauss Seidel method
11. 4^{th} order R-K method for first order ODE
12. 4^{th} order R-K method for 2^{nd} order ODE
13. Simpson's rule for double integrals

Text Books:

1. Numerical Methods for Scientific and Engineering Computations by M. K. Jain, S. R.K.Iyangar, R. K. Jain, New Age Publications.
2. Numerical Methods with Programs in C and C++ by T. Veerarajan and T. Ramchandran, Tata McGraw Hill Publication.
3. Calculus of Finite Difference and Numerical Analysis by P.P. Gupta & G.S Malik, Krishna Prakashan Media Ltd, Meerut**.**
4. Numerical Methods, second edition, by S. Arumugan, A. Thangapandi Isaac, A. Somasundaram, SCITECH Publications (India) Pvt. Ltd.
5. Programming with ANSI and Turbo C, by Ashok N. Kamthe, Pearson Education, New Delhi.

Reference Books:

1. Numerical Mathematical Analysis by J. B. Scarborough, Oxford & IBH,New Delhi.
2. Numerical Methods for Engineers by Steven Chapra, Raymond P. Canale, Tata McGraw Hill Publication.
3. Numerical Methods by E. Balgurusamy, Tata McGraw Hill Publication.

203149: FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

Teaching Scheme
Lectures: 4 Hrs. / week
Practical: 2 Hrs. / week

Examination Scheme
Written: 50 Marks [2 Hrs]
Online: 50 Marks
Oral: 50 Marks

Unit 1
Architecture of 8085, Pin Diagram, Memory interfacing, Addressing modes, Instruction set.
[8 Hrs]

Unit 2
Assembly language programming, timing diagrams, stack operations, Interrupt structure, concept of lookup table. Parallel Data transfer scheme (Synchronous, asynchronous, interrupt driven and polling type).
[8 Hrs]

Unit 3
Study, interfacing and programming of
a) PPI 8255- mode 0,1, BSR mode
b) PIT 8254- Mode 0,1,2
c) Study of ADC 0809,DAC0808
[8 Hrs]

Unit 4
Introduction to concept of microcontroller, Intel 8051 microcontroller architecture, pin diagram, special function registers, operation of I/O ports, Counters and timers in 8051, timer modes, interrupts, timer flag interrupt, serial port interrupt, external interrupts, software generated interrupt control.
[10 Hrs]

Unit 5
Instruction set of 8051, assembly language programming of 8051, Calls and subroutines, interrupts and returns. Serial data input, output, Serial data modes, serial interface with pc.
[8 Hrs]

Unit 6
Applications of 8085
1. Measurement of Power factor
2. Measurement of Energy
3. Flow measurement

Applications of 8051
1. Control of stepper motor
2. Temperature measurement
3. Speed Measurement

[6 Hrs]

List of Experiments:

Note: - Experiment-1 & experiment-8 is compulsory; select any 4 experiments from experiment-2 to experiment-7 and any 4 Experiments from experiment-9 to experiment-14.

1. Assembly language Programming using 8085 (4 programs minimum based on 8 bit addition, 16 bit addition, multiplication, largest number, smallest number, ascending order, descending order).
2. Interfacing of 8255 with 8085.
3. Interfacing of 8254 with 8085.
4. Interfacing of 8 bit D/A and A/D converter with 8085.
5. Control of D.C. motor using 8085.
6. Measurement of speed using 8085.
7. Interfacing of seven segment LED display with 8085.
8. Assembly language Programming using 8051 (4 programs minimum based on 8 bit addition of 10 numbers, multiplication, largest number, smallest number, Ascending order, Descending order).
9. Control of stepper motor using 8051.
10. Measurement of temperature using 8051.
11. Interfacing of ADC 0809 with 8051 microcontroller
12. Interfacing of DAC 0800 with 8051 microcontroller
13. Interfacing of LCD with 8051.
14. Interfacing of 4 X 4 matrix keyboard.

Text Books:

1. Fundamentals of Microprocessor and Microcomputer by B.Ram Dhanpat Rai & Sons, New Delhi.
2. Microprocssor and Peripherals by S. P. Chaudhari, Sucheta Chaudhari SCITECH Publications,Chennai.
3. The 8051 Microcontroller and Embeded Systems by Muhammad Ali Mazidi, J.G. Mazidi Pearson Education.
4. The 8051 Microcontrollers - Architecture, Programming and Applications by K. J. Ayala, Penram International Publishing(I) Pvt Ltd.
5. Design with Microcontroller by John B. Peatman, Pearson Education.

Reference Books:

1. Microprocessor Architecture, Programming & Applications by R.S. Gaonkar, Penram International Publishing (India).
2. Microprocessors and Digital systems by Liu and Gibson, Tata McGraw Hill India.
3. Intel Microcontroller Data book.
4. Intel Corporation 1990- 8 bit Embedded Controller Handbook.