Academic Scheme

For

B. Tech. Electrical Engineering

Four Years Programme

Vetted Syllabus

(I – IV Semesters- for Batch 2015 & onwards)

As per

Choice Based Credit System

Department of Electrical Engineering

IUST, Awantipora, Pulwama -192122

Department of Electrical Engineering

1st Semester

Course Code	Course Title	Type of Course	L – P	Credit
PHY-111T	Physics-I	C	4– 0	4
CHM-111T	Chemistry-I	C	4 – 0	4
MTH-111T	Mathematics-I	C	4 – 0	4
ELE-101T	Basic Electrical Engineering	CF	3 – 0	3
BIO-101T	Environmental Science	CF	4 – 0	4
CIV-101T/P	Engineering Drawing	CF	2 – 3	4
MEC-101P	Engineering Workshop	CF	0- 3	2
PHY-112P	Physics-I Lab	C	0 – 2	1
CHM-112P	Chemistry -I Lab	C	0 – 2	1
	Total Credits		**21-10**	**27**

Physics-I
PHY-111T

Unit-I

Vector Analysis, Rotation of coordinate axis and Transformation of vectors, Gradient of scalar field, divergence and curl of vector field in Cartesians, Spherical Polar and Cylindrical Coordinate systems, line, surface & volume integrals, Gauss's divergence theorem, Stokes's theorem.

Unit-II

Collision of particles, Conservative and non-conservative forces, elastics and inelastic scattering, frames of references, laboratory and center of mass system, kinematics of elastics scattering in laboratory system, application of conservation theorem in solving collision and scattering problems, Rutherford's scattering.

Unit-III

Vibration and Acoustics, Differential equation of simple harmonic motion, Energy of simple harmonic oscillator, Damped harmonic motion, Energy dissipation, Forced oscillations, amplitude and velocity resonance, sharpness of resonance, Energy consideration in forced oscillations.

Unit-IV

Electromagnetic Theory: Coulombs law and Gauss's theorem, Calculation of electric field and potential, Charged Lines and Cylinders, Charged Plates, Charged Spheres, Biot-Savart's law, Ampere's law, Applications of the Magnetic Force, Helical and Circular Motion of charged particle in Uniform B Cycloidal Motion of a charged particle in Crossed E and B fields, Modified Amperes Law, Displacement current, Faraday's.

Unit-V

Maxwell's Equations, Electromagnetic wave equation in free space, its solution in one dimension, Pointing Vector and Discussion of Energy intensity, pressure and Momentum in Electromagnetic wave. Introduction to plasma: Debye shielding, plasma parameter, plasma frequency, Tutorial problems.

Books Recommended:
1. Introduction to classical Mechanics by R.G. Takwale and P.S Puranik by TMH Publishing.
2. Classical Mechanics by N.C. Rana and P.S. Jog, Tata McGraw Hills.
Reference Books
1. Introduction to Electrodynamics by David Griffiths, Pearson Education.
2. Introduction to Plasma theory by Dwight R. Nicholson, John Wiley.
3. Vibrations and Waves by A.P French.
4. Electromagnetism by Gerald L. Pollack and Daniel R. Stump, Pearson Education Asia limited and Higher Education press.

Chemistry-I
CHM-111T

L - P
4 - 0

Unit-I

Chemical thermodynamics: Introduction and Importance, First Law of Thermodynamics, Work done in Isothermal and Adiabatic Conditions, Heat capacities, Relation between   and   relations, Second Law of Thermodynamics, Concept of Entropy, Carnot engine, Gibbs free energy, Free Energy Changes as Criteria of Reversible and Irreversible process, Gibbs-Helmholtz's equation, Clausius - Clapeyron equation.

Unit-II

Electro-chemistry: Introduction, Conductivity of Electrolytes, Kohlrausch's Law of Independent Migration of Ions and its Application, Debye Huckel Theory of Strong Electrolytes, Electrochemical cells, Electrode-Potential, Standard Electrode Potential, Types of Electrodes (Metal-Metal Ion electrode, Gas Electrodes, Metal Insoluble Metal Salt Electrode), Fuel Cells, pH Measurement and Control.

Unit-III

Introduction to Environmental Chemistry, Concept and Scope of Environmental Chemistry, Chemistry of the Atmosphere, Global Warming, Green house effect, Acid Rain: Mechanism of Formation and Effects and Depletion of Ozone Layer, Chemistry of Water and Waste Water, Measurement of acidity, Alkalinity, Hardness, BOD, COD, and Treatment of Water for Domestic and Industrial Purpose, Toxic Chemicals in the Environment, Biochemical Effects of Arsenic, Lead, Mercury and, Pesticides.

Unit-IV

Introduction to Alloys, Advantages of Alloys over other Metallic Materials, Manufacturing of Alloys (Fusion Method, Powder Metallurgy, Electro-deposition and Reduction method), Classification of Alloys (Ferrous and non-Ferrous metal Alloys), Carbon steels (Carbon Steels Classification, Composition and Uses), Alloy Steels (Low, Medium and High alloys steels), Effect of Different Alloying Elements on Properties of Alloy steels, Engineering Application of Copper, Nickel and Aluminum Alloys.

Unit V

Instrumental Techniques-I: Introduction, Advantages and Disadvantages of Instrumental and Non-Instrumental Methods, Electromagnetic Radiation, Electromagnetic Spectrum, Light Absorption (Beers-Lambert Law) UV-Vis spectroscopy (Types of Transition, Chromophors, Auxo-chromes and Applications) Infrared Spectroscopy (Modes of vibration, IR bands corresponding to different functional groups and Applications).

Books Recommended:

1. Chemistry in Engineering and Technology Volumes I & II by J.C. Kuriacose and J. Rejaraman, Tata McGraw Hill publishing company Limited, New Delhi
2. Engineering Chemistry by P.C. Jain, Dhanpat Rai & Sons, New Delhi)
3. Physical Chemistry by Puri Sharma and Patharua
4. Inorganic Chemistry by J.D. Lee
5. Physical Chemistry by Peter Atkins, Juliodepaula
6. Electrochemistry and Corrosion Science by N. Perez
7. A Textbook of Organic Chemistry by V. K. Ahluwalia and Madhuri Goyal
8. Organic Chemistry: Stereochemistry by I. L. Finar, Pearson Education
9. Environmental chemistry by A. K. De, New Age International

Reference Books:

1. Chemistry of Engineering Materials by C.V. Agarwal Tata publishing Works, Varanasi
2. Chemistry in Engineering by L.A. Munro Prentice Hall, New York
3. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS
4. Applied Chemistry Theroy and Practive by O.P. Vermani and A.K. Narula, Wiley Eastern Limited, New Delhi
5. Applied Chemistry for Engineers R. M. E. Diamand, (Pitman)
6. Laboratory Manual on Engineering Chemistry by S.K. Bhasin and Sudha Rani, Dhanpat Rai Publishing Company, New Delhi

Mathematics-I
MTH-111T

UNIT-I
Introduction to differential calculus, Leibnitz's Theorem for   derivative, Taylor's theorem, Tangent and Normal, Partial Differentiation, Euler's theorem, Double points, asymptotes, curvature and tracing of curves.

UNIT-II
Limit, continuity and differentiability of functions of several variables, Chain rule, Jacobi theorem, Taylor's theorem of one and two variables, extrema of functions, two or more variables using method of Lagrange's multipliers.

UNIT-III
Ordinary differential equations: Exact ordinary differential Equations and Ordinary differential equations reducible to exact differential equations, Linear differential equations and equations reducible to linear form, Linear Differential equations of second and higher order with constant and variable coefficients, Applications of Ordinary Differential Equations.

UNIT-IV
Series solutions of Ordinary Differential Equations.

UNIT-V
Algebraic Equation, Elements of the theory of polynomial equations, Fundamental theorem of Algebra, Relation between the roots and the coefficients of an equation, Solution of cubic & bi-quadratic equations.

Books Recommended
1. Differential calculus, Shanti Narayan, S.Chand
2. A text Book on Engineering Mathematics by Bali, N.P, Luxmi Publications
3. Ordinary and Partial Differential equation, M.D. Raisinghania, S. Chand and Co

Reference Books
1. Advanced Engineering Mathematics by Jain, R.K. and Iyengar SRK, Narosa,
2. Advanced Engineering Mathematics, Kreyszig, J.Wiley
3. Linear Algebra, Hoffmann & Kunze, Prentice-Hall
4. Differential equations and its applications, H.T. Piaggio, Prentice-Hall
5. Engineering mathematics, Vol I-II, Sastry, Prentice Hall of India

Basic Electrical Engineering
ELE-101T

UNIT I

Introduction to DC circuits, Active and passive two terminal elements, Types of Voltage and Current Sources, Ohms law, Voltage-Current relations for resistor, inductor & capacitor, Kirchhoff's laws, Mesh analysis, Nodal analysis, current division, voltage division, Conventions for describing networks, Reference directions for currents and voltages.

UNIT II

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Application of network theorems in solving various circuits, Star-Delta Transformation.

UNIT III

Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator, Analysis of R-L, R-C & R-L-C Circuits, Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT IV

Working principle, construction and applications of DC machines and AC machines (1 - phase transformers, single phase induction motors), introduction to alternator: Principle of operation and working.

UNIT V

Safety measures in electrical system- types of wiring- wiring accessories staircase, fluorescent lamps & corridor wiring- Basic principles of earthing –Types of earthing.

Books Recommended

1. Engineering Circuit Analysis by William H Hayt, J E Kemmerly and Steven M Durbin, McGraw Hill.
2. Electrical Engineering fundamentals by Deltoro, Prentice Hall India (PHI).
3. Basic Electrical Engineering by D.P. Kothari. and I. J. Nagrath Tata McGraw - Hill.
4. Basic Electrical and Electronics Engineering by S.K. Bhattacharya Pearson Education.
5. Circuit Theory (Analysis & Synthesis) by A. Chakrabarti, DhanpatRai & Co.

Environmental Science
BIO – 101T

Unit I

Multidisciplinary nature of environmental studies**:** Definition, scope and importance, Need for public awareness.

Unit II

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystem:-

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Bio-geographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit V

Environmental Pollution: Definition, Causes, effects and control measures of:-

a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards

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

Unit VI

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.

- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit VII

Human Population and the Environment
- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit VIII

Field work
- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE

1. Environmental Biology by K.C. Agarwal, Nidi Publications Ltd. Bikaner.
2. The Biodiversity of India by Bharucha Erach,, Mapin Publishing Pvt. Ltd.
3. Hazardous Waste Incineration by R.C. Brunner, McGraw Hill.
4. Marine Pollution by R.S. Clark Clanderson Press Oxford (TB).
5. M.T. Environmental Encyclopedia by Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth,, Jaico Publications House, Mumbai,
6. Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Water in crisis, Pacific Institute for Studies in Dev. Environment & Security by H.P. Gleick, Stockholm Env. Institute Oxford Univ. Press.
9. Encyclopedia of Indian Natural History, Bombay Natural History Society by R.E. Hawkins Bombay (R)
10. Global Biodiversity Assessment by V.H. Heywood, & R.T. Waston, Cambridge Univ. Press 1140p.
11. Environmental Protection and Laws by H. Jadhav, & V.M. Bhosale, Himalaya Pub. House, Delhi.

Engineering Drawing
CIV-101T/P

L - P
2 - 3

UNIT I
Basic concepts of drawing quadrants, drawing instruments, types of lines etc., Dimensioning: General rules of dimensioning, Types: Aligned, unidirectional, chain, parallel, combined, title, block & margins.

Orthographic projections: Concept of horizontal and vertical planes, first and third angle projections, orthographic projections of simple blocks, missing lines and missing views, Projection of points, lines and planes: Projection of points in different quadrants, projection of lines and planes positioned in different orientations with respect to the principle planes.

UNIT II
Projection of solids: Projection of simple geometrical solids placed in simple positions and with single rotations of the face, edge or axis of the solid with respect to one of the principal planes of projection.

UNIT III
Section of solids: Principal of sectioning, Section of simple geometrical solids, types of the section planes and their trace representation and location, true shape sections, sectioning by auxiliary planes.

UNIT IV
Development of surfaces: Development of surfaces of simple sectional solids and intersecting solids, transition pieces, cones & cylinders.

UNIT V
Isometric projections: Classification of pictorial projections, Isometric projection of plane figures, prisms, pyramids, cylinders and for the given orthographic projections, Introduction to Auto CADD, Basic commands of CADD.

Books Recommended :
1. Engineering Drawing by P.S. Gill, S.K. Kataria and son.
2. Engineering Drawing by N.D. Bhatt, Charotar Book Stall, Tulsi Sadan, Anand
3. Engineering Graphics with Auto CADD by James, D Bethune.
4. Engineering Drawing by Narayana, Kannaiya, Scitech Publications, Chennai

Reference Books:
1. Sham Tickoo, Auto CADD
2. B.C. Rana M.B. Shah Engineering Drawing, Pearson Education

Engineering Workshop
MEC-101P

UNIT I
Machine Shop: Operation and function of various machine tools like Lathe, for turning, facing, chamfering, grooving, knurling, boring & thread cutting, Shaper machine, for preparation of horizontal surfaces, slots and V-grooves, Milling machine, for side, end and face milling & making of spur gear, Drilling machines, for drilling and reaming operations, Grinding machines, for various grinding operations and CNC machine, for simple, step and taper turning operations.

UNIT II
Fitting Shop: Exercise on marking, cutting, chipping, filing, drilling, taping, reaming, pipe threading and making nut & bolt and single ended spanner, Exercise on V, L, dove-tail & radius fittings.

UNIT III
Sheet Metal Shop: Exercise on development of sheet metal surfaces like cylinder, funnel, rectangular duct and 900 bend. Soldering & brazing of various joints, making single/double riveted lap-joint & single cover plate riveted but-joint.

UNIT IV
Welding Shop: Operation and function of various welding machines like Electric arc welding machine for various joints like lap, butt & T and preparation of small cot-frame from conduit pipe, Gas welding machine for cutting & joining operations and square pyramid from conduit pipe, TIG & MIG welding machines for basic operations, Spot & Seam welding machines for simple joints.

UNIT V
Carpentry and Pattern Making Shop: Various types of timber, defects in timber, exercise on various operations and making joints like half lap (T, dove-tail, cross), mitre & lengthening and mortise & tenon, Simple exercise on wooden, Lathe including pattern making and railing.

UNIT VII
Foundry Shop: Exercise to prepare the green moulding sand, to prepare core and mould (single/double piece pattern), Casting of ferrous & non-ferrous metals after mould preparation for simple castings.

UNIT VIII
Smithy Shop: Smith's tools & their use, exercise for forging operations for making L-hook, chisel, square & hexagonal head bolts.

BOOKS RECOMMENDED

1. A course in workshop technology B.S. Raghuvanshi, Vol. I - II. Dhanpat Rai and Sons.
2. Workshop Practice, Vol I - II Hajira Chowdry.

Physics-I Lab
PHY-112P

L – P
0 – 2

List of Experiments

1. To determine the value of e/m of electron

2. To study the bar pendulum

3. To study the Kater's reversible pendulum

4. To study the bending of beam apparatus

5. To study the Newton's ring apparatus

6. To determine the wavelength of light using a spectrometer

7. To study a Polarizer and analyzer

8. Stephens constant using incandescent lamps

9. Energy band of a semi-conductor diode

Recommended Books:

1. Practical Physics by SL Gupta
2. Advanced Practical Physics, SP Singh, Pragati Prakashan

Chemistry Lab-I
CHM-112P

List of Experiments

Basic Introduction on Solution Preparation, Concentration terms, Handling of Glass wares Chemicals and Instruments, Precautions

1. Determination of strength of NaOH solution by standardization of sodium hydroxide using Oxalic acid
2. To determine the acid value of a given mineral oil or vegetable oil.
3. To determine the moisture content of a given sample of coal.
4. To determine the Degree of dissociation of a weak acid by Conductometry
5. Determination of the strength and pK_a value of the weak acid by titration with a alkali.
6. Estimation of calcium in Lime stone
7. To determine the Aniline point of the given sample of a Lubricating oil
8. To test the validity of Beer-Lambert law using spectrophotometer and determine the unknown concentration of solution.

Demonstration Experiments

1. Determination of pH of different concentration of acid and bases by pH meter
2. Determination of calorific value of solid fuels using Bomb Calorimetery

2nd Semester

Course Code	Course Title	Type of Course	L – P	Credit
PHY-211T	Physics-II	C	4 – 0	4
CHM-211T	Chemistry-II	C	4 – 0	4
MTH-211T	Mathematics-II	C	4 – 0	4
CSE-201T	C Programming	CF	4 – 0	4
CIV-201T	Elements of Civil Engineering	CF	3 – 0	3
ECE-201T	Basic Electronics & Communication Engineering	CF	3 – 0	3
PHY-212P	Physics-II Lab	C	0 – 2	1
CHM-212P	Chemistry-II Lab	C	0 – 2	1
CSE-202P	C Programming Lab	CF	0 -2	1
	Total Credits		**22– 6**	**25**

Physics – II
PHY-211T

Unit-I

Quantum Mechanics: Why Quantum Physics, De-Broglie Hypothesis, Davison Germer experiment, Young's Double slit experiment, Uncertainty principle and Wave Packet, Wave function and its properties, Expectation value, Operators, Normalisation, Schrodinger wave Equation, Time Dependent and Time Independent, Continuity equation in QM, Schrodinger equation for free Particle, Particle in a Box, Step potential Tunnelling effect and its example (Tunnel diode or alpha decay).

Unit-II

Elementary Solid State Physics: Crystal lattice, Crystal structure, Unit cells, Miller Indices, Bravais lattice, Photographic crystal X-ray diffraction techniques, Laue's method, Classification of solids, formation of energy bands in metals, semiconductors and insulators, intrinsic and extrinsic semiconductors, Fermi energy.

Unit-III

Diffraction: Optical diffraction techniques- Fresnel diffraction, Fresnel Diffraction from a Slit. Fraunhoffer Diffraction, Fraunhoffer diffraction from a circular aperture, Fraunhoffer diffraction from a rectangular aperture, Polarization of light, Plane, Circular, Elliptical Polarization.

Unit-IV

Special theory of Relativity: Frames of reference, Michelson-Morley experiment, Absolute Space and Absolute Time, Need for Relativity, Basic postulates of special theory of relativity, Length contraction, Time dilatation, Relativistic Momentum, Mass-energy relation, Superconductivity: Meisner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), applications of superconductors.

Unit-V

Lasers: Introduction, Principle of laser, Stimulated and spontaneous emission, Population inversion, Einstein coefficients, optical pumping, Resonant Cavity and its modes, He-Ne Laser, Ruby Laser, Semiconductor Lasers, Applications of Lasers.

Text Books :

1. Optics by Ghatak
2. Optics by N. Subrahmanyam and BrijLal

Reference Books :

1. Fundamentals of Optics by Jenkins and White
2. Applied Solid State Physics by Rajnikant

Chemistry-II
CHM-211T

Unit-I

Nano-Technology: Nanoscale and Its Significance, Properties at Nanoscale: Optical, Electrical, Thermal, Mechanical and Magnetic, General Methods of Preparation of Nanomaterial's viz Top Down (Ball Milling, Nanolithography) and Bottom up Methods (Sol-Gel, Solution Based Method), Carbon Nanotubes (Properties and Applications)

Unit-II

Corrosion: Introduction, effects of corrosion, Factors effecting the rate of corrosion (Nature of the metal and Nature of the environment), Electrochemical Theory of Corrosion, Dry Corrosion and Wet Corrosion, Types of Corrosion (Pitting Corrosion, Crevice Corrosion, Galvanic Corrosion and Stress corrosion), Testing and Measurement of Corrosion, Corrosion Protection and Inhibition, Cathodic Protection, Anodic Protection, Protective Coatings.

Unit-III

Polymers: Advantages of Polymers over other Engineering Materials, Functionality, Degree of Polymerization, Concept of Molecular Weight, Polymerization (Addition, Condensation and Copolymerization), Polymerization Techniques (Bulk, Solution, Suspension and Emulsion polymerizations), Preparation, Properties and Engineering application of some Important Polymers, Polythene (LDPE and HDPE), Polyvinyl Chloride, Polystyrene, Teflon, Phenol Formaldehyde, urea-formaldehyde resin, Introduction to polymer iccomposites.

Unit-IV
Lubricants: Introduction, Function of Lubricants, Mechanism of Lubrication, Classification of Lubricants (Liquid ,Semisolid , Solid), Properties of Lubricants (Flash Point and Fire Point, Viscosity , Aniline Point Acid value).

Unit-V
Instrumental Techniques-II: Nuclear Magnetic Resonance: Principle, shielding mechanism, chemical shift, number of Signals, application of nuclear magnetic resonance to simple organic molecules, Introduction to Thermal Analysis: Principle, Working and Application (TGA,DTA), X-ray Spectroscopy: Principle and Applications.

Books Recommended:

1. A Text Book of Engineering by S.S Dara S Chand & Co limited New Delhi

2. Advanced Practical Physical Chemistry by Yadav, Goyal publication

3. Spectroscopic methods by Williams and Fleming

4. Applied Chemistry : Theory And Practice by O. P. Vermani

5. Laboratory Manual on Engineering Chemistry by S.K. Bhasin and Sudha Rani, DhanpatRai Publishing Company, New Delhi

6. Applied chemistry by V. M. Balsaraf &Et. I. K. Al, International Publishing House Pvt. Ltd.

7. Electrochemistry and Corrosion Science by N.Perez

8. Analytical chemistry: An Introduction byDouglas A. Skoog, Donald M. West, F. James Holler

9. Polymer Science by V.R.Goowriker, N.V Viswanathan and jayadevSreedhar by Wiley Easter Limited New Delhi

10. Nanotechnology Fundamentals And Applications by ManasiKarkare & Rajni Bahuguna

11. Nanotechnology Importance And Application by Fulekar

12. Physical Chemistry by Puri Sharma and Patharua.

13. Solid State Chemistry and its Applications by Anthony R. West, Wiley Publisher

Mathematics-II
MTH-211T

UNIT-I

Non-linear differential equation of first order, Simultaneous differential equation, Simultaneous differential equation of the form $\frac{}{} = \frac{}{} = \frac{}{}$, Applications of ordinary differential equations, Differential Equation: Partial differential equations of first order, langrage linear equation Standard form, Charpit`s Method to solve non-linear partial differential equation.

UNIT-II

Partial differential equations of second and higher, Homogeneous Partial Differential equations with constant coefficients, vibration of stretched flexible string, heat flow equation, Wave equation, solutions by the method of separation of variables.

UNIT-III

Fourier Series, Integral Calculus: Differential under the sign of integration. Double and triple integrals, change of variables, Beta and Gamma functions.

UNIT-IV

Matrices: Review of algebra of matrices, Orthogonal and unitary matrices, partitioning of Matrices, Trace of Matrices, Triangular matrices, Rank of a matrix, elementary transformations, Inverse by Elementary Transformation.

UNIT-V

Normal Form of a Matrix, solution of simultaneous equation by elementary operation, Caley-Hamilton theorem, Eigen values, and Eigen vectors of a matrix, Quadratic Form.

Books Recommended:

1. Advanced Engineering Mathematics by E.Kreyszig
2. Differential equations and its applications, H.T. Piaggio, Prentice-Hall
3. Applied Mathematics for Engineers by P.N. Wartikar
4. Advanced Engineering Mathematics,2/e by Greenberg, Pearson education, 2004
5. Ordinary and partial Differential equation, M.D. Raisingania, S.Chand and Co
6. Linear Algebra, Hoffmann & Kunze, Prentice-Hall
7. Mathematical Analysis by S.C. Malik & Savita Arora New Age international Limited
8. Integral Calculus by Shanty Narayan.

C Programming
CSE-201T

L – P
4 – 0

Unit-I

Computer components, characteristics & classification of computers, hardware & software, peripheral devices, system software, application software, utility program, compiler, interpreter, Assemblers, Evolution of programming languages, Algorithms, Dataflow Diagram, introduction to compiler/ Assembler/Interpreter.

Unit-II

Structure of C program, Identifiers, Keywords, Data Types, Constant and Variables, Operators: Precedence and Associativity, Expressions, Statements, Input and Output functions, storage classes, type casting, Macros.

Unit-III

Control structures: Branching & looping, One Dimensional Array, Multidimensional Array and their applications, string manipulation.

Unit-IV

Library and User defined functions, Formal and Actual parameters, function prototypes, Parameter passing (Call-by-value,), Recursion, Structures, unions.

Unit-V

Pointer variable, Pointer Arithmetic, passing parameters by reference, pointer to pointer, pointers to functions, dynamic memory allocation, pointer to structure & pointer to union, Pointers to Multidimensional Arrays, Declaration of file pointer, opening and closing files, working with text files.

Books Recommended:

1. Programming in ANSI C by E. Balaguruswami, TMH
2. Programming in C by Byron Gottfried, TMH
3. Computer fundamentals and programming in C by Pradip Dey & Manas Ghosh, OXFORD University Press
4. The 'C' programming language by Ritchi, Kernighan & D.M. Ritchie, PHI
5. C The Complete Reference by H. Sohildt, TMH
6. Let us C by Y. Kanetkar, BPB Publications
7. Computer Science - A Structured Programming Approach using C by B.A. Forouzan &R.F. Gillberg, Cengage Learning.

Elements of Civil Engineering
CIV-201T

UNIT-I

Introduction to Civil Engineering: Overview of Civil Engineering; Civil Engineering land marks, Impact (social, economic, environmental) of Civil Engineering on society, introduction to various branches of civil Engineering, Future directions: Job opportunities in Civil Engineering.

UNIT-II

Stress & Strain: Forces & stresses, Body Forces, surface forces, Internal forces, components of stress in rectangular co-ordinates, Uni-axial tensile test, Elasticity, An-elasticity, Work-hardening, anisotropy, homogeneity and continuity, generalized Hooke's law, Lame's constants, Modulus of rigidity, Bulk modulus, relation between the elastic constants, Principle of superposition, Uniqueness theorem, Thermal effects, Center of Gravity (symmetrical & un-symmetrical sections), moment of inertia of symmetrical & unsymmetrical sections, parallel axis theorem, perpendicular axis theorem, radius of gyration.

UNIT-III

Bending moment & Shearing Force: Notation & sign convention for flexural loads, shear force & bending moment, diagrams of determinate structures, (Cantilever, simply supported beams & varying load beams) supported to point loads, UDL and VDL, computing of reactions using equation of equilibrium.

UNIT-IV

Trusses: Planner Truss structures, idealization of planar structures, sign convention & member force representation, analysis of trusses by methods of Joints, graphical and sections.

UNIT-V

Torsion of shafts: Geometry of deformation of a twisted circular shaft, Stress and deformation in twisted circular solid and hollow shafts, Strain energy due to torsion, Power transmitted by circular shafts.

BOOKS RECOMMENDED:

1. Engineering Mechanics by I.H. Shames Prentice Hall, New Delhi.
2. Vector Mechanics for Engineers by F.P. Beer, and Johnston, McGraw Hill Edition.
3. Engineering Mechanics by D.S. Kumar, S.K. Kataria & Sons, New Delhi.
4. Engineering Mechanics by J. L. Meriam and L. G. Kraige, John Wiley.
5. Strength of Materials by Khurmi.
6. Strength of Materials by Ramamurtha.

Basic Electronics and Communication Engineering
ECE-201T

L – P
3 – 0

UNIT-I

Electronic Components: Active and Passive (Resistors, Inductors and Capacitors) components, Introduction to Semiconductors: P and N type Semiconductors, Transport Mechanism of Charge Carriers, Charge Densities in a Semiconductor, Electric properties, Hall Effect, Generation, Recombination, Diffusion, Continuity Equation, Injected Minority Carrier Charge.

UNIT-II

PN Junction: Open Circuited PN Junction, Current Components in PN junction Diode, Basic Principle, Operation and Volt-Ampere Characteristics of PN Junction Diode, Temperature Dependence of V/I Characteristics, Piecewise linear Diode Characteristics, Diode Resistance, Diode Capacitances in detail, Charge Control Description of a Diode, Junction Diode Switching Times, BJT and its types.

UNIT-III

Digital Electronics: Introduction to digital Electronics, Gates (Basic & universal), Boolean algebra, laws & theorems, simplification of Boolean expression, Basics of Microprocessor 8085 and its pin diagram.

UNIT-IV

Communication Systems**:** Introduction to Communication System, elements of Communication System, Benefits of Communication, Communication Media, Modulation and Demodulation (brief idea).

UNIT-V

Transducers: Classification of Transducers, Basic Requirements of Transducers, Passive Transducers, Strain Gauge, Thermistor, LVDT, Active Transducers, Piezoelectric and Thermocouple.

TEXT BOOKS:
1. Electronic Devices & Circuits by J.B. Gupta
2. Integrated Electronics by Millman & Halkias
3. Communication system Analog and Digital by Sanjay Sharma

REFERENCE BOOKS:
1. Electronic Communication system by G. Kennedy
2. Electronic Communication Systems (Fundamentals through advanced) by W. Tomassi, Pearson Education.
3. Electronic Devices and Circuit Theory by Boylestead and Nashelsky.

Physics - II Lab
PHY-212P

List of Experiments:

1. Determination of refractive index of prism by spectrometer.
2. Determination the wavelength of sodium light by diffraction grating.
3. Determination of Wavelength of sodium light by Newton's ring.
4. Study of Zener diode voltage regulating characteristics.
5. To study double slit interference by He-Ne laser.
6. To plot the graph for the transistor characteristics.
7. To plot the graph for the semi-conductor diode.
8. To find the dead time of a G. M. Counter

Chemistry-II Lab
CHM-212P

L - P
0 - 2

List of Experiments:

1. Synthesis of the phenol formaldehyde resin
2. To titrate Fe(II) with $KMnO_4$ spectrophotometrically.
3. To determine the dissociation constant of methyl red by spectro photometric method
4. To determine the temporary and permanent hardness of the a sample of water by complex ometeric titration
5. To determine the Alkalinity of the given sample of water.
6. Determination of the ion exchange capacity of cation exchange resin.
7. Separation of a mixture of inorganic ions by paper chromatography.

Demonstration of experiments:

Determination of specific rotation of the sucrose by polraimetery

Spectrophotometer (concentration determination, wavelength maximum)

C Programming Lab
CSE-202P

List of Experiments:

1. Programs to understand the basic data types.
2. Program for looping and decision statements.
3. Programs to generate odd, even, fibnoccii, lucas and other common series using loops.
4. Programs using built-in math functions.
5. Programs on arrays.
6. Program to implement linear search.
7. Programson two dimension array.
8. Program to add and multiply two Matrices.
9. Program to find transpose of a Matrix
10. Program to read and display array using functions
11. Programs on string manipulations.
12. Write functions for finding sum, difference, product and remainder between two numbers and return the result
13. Programs on functions.
14. Write a function to find factorial using recursion
15. Programs on structures and unions.
16. Programs on pointers
17. Write a function to swap two numbers using call by reference?
18. Write a function to find minimum of an array using pointers.?
19. Write a function to reverse a string using pointers?
20. Programs on basic file operations

Department of Electrical Engineering

3rd Semester

Course Code	Course Title	Type of Course	L – P	Credit
ECE-311T	Analog Electronics	C	4 – 0	4
ELE-311T	Network Analysis	C	4 – 0	4
ECE-313T	Digital Electronics & Logic Design	C	4 – 0	4
ELE-312T	Electrical Engineering Materials	C	4 – 0	4
MTH-313T	Laplace, Fourier Transforms & Complex Analysis	C	4 – 0	4
XXX-xxxX	Elective-I	G		X
ECE-315P	Analog Electronics Lab	C	0 - 2	1
ELE-313P	Basic Electrical Engineering Lab	C	0 - 2	1
ECE-317P	Digital Electronics & Logic Design Lab	C	0 – 2	1
ELE-314P	Introduction to MATLAB	C	0 – 2	1
	Total Credits		**20 – 8**	**24 + X**

Analog Electronics
ECE - 311T

Unit I

Diode Circuits: Diode as a circuit element, Load Line Concept, Rectifiers: Half Wave Rectifier, Full Wave Rectifier (CT and bridge type), Derivation of rectifier specifications, Analysis and design of filters with rectifiers, Diode Clipping and Clamping Circuits, Comparators, Peak Detector, Sampling Gate, Voltage Multiplier Circuits, Basic operation of Zener Diode, Avalanche Breakdown, Zener Breakdown, Zener Diode as a Voltage Regulator, Schottky Diode, Tunnel Diode.

Unit II

Transistors (BJT): Current Components of Transistor, Types, Transistor as an Amplifier, Operation and Characteristics, Ebers-Moll model, Analysis and Design of CE, CB and CC Configurations, Input-Output Characteristics and Graphical Analysis of Basic Amplifier Circuits, Maximum Voltage Rating, Early-Effect.

Unit III

Transistor Biasing: Operating Point, Load Lines, Need for Bias Stabilization, Biasing Configurations: Fixed Bias, Collector-to-Base Bias, Bias Circuit with Emitter Resistor, Voltage Divider Biasing, Emitter Bias, Bias Stability, Stability Factor, Bias Compensation Techniques, Thermal Runaway, Thermal Stability.

Unit IV

Transistor at Low Frequency: Two port devices and hybrid model, Transistor hybrid model, h-parameters, Analysis of a transistor amplifier circuit using h-parameters, Miller's Theorem, Cascading transistor amplifiers, High input resistance transistor circuit.

Unit V

Transistor at High Frequency: Hybrid Pi (π) Common Emitter Transistor model, Hybrid π Capacitances, Common Emitter Short Circuit Current Gain, Validity of Hybrid π Model, Multistage Amplifiers, RC Coupled, Direct Coupled, Transformer Coupled, Frequency response of an amplifier, Bandwidth, Gain-Bandwidth Product, Cascode Amplifier, Darlington pair, Bootstrapped Darlington circuit.

Books Recommended:
- Electronic Circuits by D. Schelling and C. Belove.
- Integrated Electronics by Millman & Halkias.
- Electronic circuits by G. Grob.
- Electronic Devices and Circuit Theory by Boylestead and Nashelsky.
- Microelectronic Circuits Adel S. Sedra and Kenneth C. Smith.

Network Analysis
ELE - 311T

UNIT I

First order differential equation: Differential equations as applied in solving networks, Application of initial conditions, Evaluating initial conditions in networks, Laplace Transformation properties, Solution of Network problems with Laplace transformation, Wave form analysis and synthesis: The unit step, ramp and impulse functions and their Laplace transforms, Initial and final value of f (t) from f (S), Convolution integral, convolution as summation.

UNIT II

Network theorems and impedance functions: Complex frequency, transform impedance and transform circuits, series and parallel combinations of elements, Network Functions-poles and zeros: Network functions for one port and two port networks (ladder and general networks), Poles and zeros of network functions, Restriction on pole and zero locations for driving point and transfer functions, Time domain behavior from pole zero plot.

UNIT III

Two port parameters: Relationship of two port parameters, Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, Parallel connection of two port Networks, Characteristics impedance of two port networks.

UNIT IV

Network synthesis- Synthesis problem formulation, properties of positive real functions, Hurwitz polynomials, properties of RC, LC and RL driving point functions, Foster and Cauer synthesis of LC and RC circuits.

UNIT V

Filter fundamentals – pass and stop band, filter classification, constant K & m derived filters, behaviour of characteristic impedance over pass & stop bands, design of filters.

Books Recommended
1. Network Analysis by Van Valkenberg.
2. Network Analysis & Synthesis by F. Kuo.
3. Ryder JD, Networks, Fields & Lines.
5. Circuit Theory (Analysis & Synthesis) by A. Chakrabarti, Dhanpat Rai & Co.

Digital Electronics and Logic Design
ECE - 313T

L – P
4 – 0

UNIT I

Binary, octal and hexa- decimal number systems, binary arithmetic, binary code, excess-3 code, gray code, error detection and correction codes. Boolean algebra: Postulates and theorems, logic functions, minimization of Boolean functions using algebraic, Karnaugh map and Quine – McClausky methods, realization using logic gates.

UNIT II

Introduction to combinational circuits, realization of basic combinational functions like Adder, Subtractor, Encoder, Decoder, Multiplexer, Comparators, delays and hazards in combinational circuits, Code converters – Implementation using MUX and ROM.

Unit III

Flip-Flops: SR, JK, T, D, Master/Slave FF, triggering of FF, Analysis of clocked sequential circuits-their design, state minimization, state assignment, circuit implementation, Registers: shift registers, inter-conversion of shift registers, Counters.

UNIT IV

Programmable Array Logic, Programmable Logic Array – GAL, RISC, CISC – basic concepts.

UNIT V

RTL, DCTL, I²L, DTL, HTL, TTL, ECL, NMOS and CMOS logic gates, circuit diagram and analysis, characteristics and specifications, tri-state gates, totem-pole configuration.

Books Recommended:

1. Digital logic and Computer Design by Morris Mano, Prentice-Hall of India.

2. Digital Systems, Principles and Applications by Ronald J. Tocci, Prentice-Hall of India.

3. Modern Digital Electronics R.P. Jain, Tata McGraw Hill.

4. Digital Fundamentals by T.L. Floyd, E. Charles, Merrill Publishing Company.

Electrical Engineering Materials
ELE - 312T

L – P
4 – 0

Unit I

Crystal structure: crystalline state, Bravais lattices, Miller indices, Reciprocal lattice, Common Crystal structures, Crystalline Interference, Bragg Diffraction, crystal imperfections.

Unit II

Free electron theory, conduction in metals and alloys, conductors and resistors, Materials for resistors, some important resistor alloys, capacitors and inductors.

Unit III

Magnetism, magnetic properties of materials, diamagnetic, paramagnetic and ferromagnetic properties of materials, ferromagnetism and anti-ferromagnetism, ferrites and other magnetic materials

Unit IV

Some important carbon steels and precipitation hardening type magnet alloys and their applications, Optical properties of materials, Growth of single crystals, Zone refining techniques, vapour phase deposition.

Unit V

Dielectric materials and their properties, dielectric constant, properties of optical materials, piezo-electricity, Semiconductors, their properties and applications, superconducting materials.

Recommended Books:

1. Introduction to solid-state physics by Kittle
2. Solid state physics by Dekker
3. Material science & Engineering by Raghavan
4. Electronics & materials by Streetman
5. Dielectric Materials and Application by A.R. Van Hippel

Laplace, Fourier Transforms & Complex Analysis
MTH - 313T

L – P
4 – 0

Unit I

Laplace transform, Shifting theorem, Laplace transforms of different functions, Heaviside's unit function, Dirac Delta function and its Laplace Transforms, Heaviside's expansion theorem, Inverse Laplace transforms, Initial and final value theorems, convolution theorem and applications.

Unit II

Use of Laplace transforms in the solution of linear differential equations, Z -Transform, Inverse Z-Transform & Applications of Z Transform to Difference Equations.

Unit III

Bessel's functions, Recurrence relations, modified Bessel's function of first kind, Legendre polynomials, Rodrigue's formula and Recurrence relations.

Unit IV

Definition of Fourier transform, Fourier Sine and Cosine transform, Fourier integral formula.

Unit V

Introduction to complex variables, analytic functions, harmonic conjugate, conformal transformation of some simple functions, Cauchy`s Theorem and Cauchy`s integral formula, Taylor`s and Laurant`s Theorems with classification of Singularities, Cauchy`s Residue Theorem (Applications only).

Recommended Books:

1. Laplace Transforms by Spiegel , Schaum Series
2. The use of Integral Transforms by N.Snedden, Tata McGraw Hill
3. Integral Transforms by Loknath Debnath, C.R.C. Press, New York.
4. Complex variables and applications by R.V. Churchill, McGraw Hill International Book Company
5. Advance Engineering Mathematics by R.K. Jain & S.R.K. Iyengen-Norosa.
6. Higher Engineering mathematics, B.S. Grewal, Khanna Publishers, Delhi

Elective-I (G)

XXX-xxxX

Analog Electronics Lab
ECE-315P

L – 0
P – 2

List of Experiments:

1. To get familiar with the working knowledge of the following instruments: CRO, Multimeter, function generator, Regulated power supply, Active and Passive Components, Breadboard

2. Study of V-I characteristics of diode

3. To study and draw the characteristics of half wave and full wave rectifiers

4. To study and draw the characteristics of rectifier filter circuits.

5. To assemble and observe the performance of clipper and clamping circuits

6. To obtain Zener diode characteristics and use zener diode as voltage regulator

7. To obtain the characteristic of transistor configurations (CE, CB, CC)

8. To plot the V-I characteristics of BJT and determine hfe, hre, hie, hoe

9. To plot the gain- frequency response of CE amplifier.

10. To plot the gain- frequency response of emitter follower amplifier

11. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth

Basic Electrical Engineering Lab
ELE - 313P

L – P
0 – 2

List of Experiments:

1. To study the color coding of resistors. Connection of Ammeters, voltmeters, Wattmeter's and Millimeters in DC and AC circuits and selection of their ranges, Use of LCRQ meter.

2. To study the series and parallel operation of resistors and verifying their effective values by LCRQ meter.

b) Repeat the same for inductors.

c) Repeat the same for capacitors.

Experiments on D.C. Circuits:

3. To verify the KVL and KCL in D.C. circuits.

4. To verify the star delta transformation of networks.

5. To verify the superposition theorem.

6. To verify the maximum power transfer theorem.

7. To verify Norton's Theorem.

8. To verify Superposition Theorem.

Experiments on A.C. Circuits:

9. To measure electric power in single phase AC circuits with resistive load, RL load and RLC load.

10. To measure the power and power factor in three phase AC circuits.

11 To study the series resonance.

12. To study the parallel resonance.

Digital Electronics and Logic Design Lab
ECE - 317P

L - 0
P - 2

List of Experiments:

1. To verify the truth table of the following logic gates:
    *   AND, OR, NOT

    *   NAND, NOR, XOR, XNOR

2. Realization of :
    *   Half Adder and verify its truth table
    *   Full Adder and verify its truth table
    *   Half subtractor and verify its truth table
    *   Full subtractor and verify its truth table
    *
3. To design multiplexer and demultiplexer using 2-input NAND gates.

4. Realization of :
    *   Flip-Flops
    *   Ripple Counters

Introduction to MATLAB
ELE - 314P

L – P

0 – 2

Basics of MATLAB, MATLAB windows, Arithmetic calculations, use of variables, arrays, matrix & Array operations; Arithmetic, Relational & Logical Operations, Elementary math functions, character settings, saving & loading data, Mat-files, Matrix functions.

Programming in MATLAB, Script files, Function files, Global variables, Loops, branches & control flow, interactive input, graphics: 2-D & 3-D plots, style options, titles, axes control, zoom.

Curve fitting, Interpolation, Eigen values & Eigen Vectors.

B-Tech Electrical Engineering

Semester-IV

Course Code	Course Title	Type of Course	L – P	Credit
ELE-411T	Electrical Machines-I	C	4 – 0	4
ELE- 412T	Control Systems	C	4 – 0	4
ELE-413T	Electrical Measurements& Instrumentation	C	4 – 0	4
ECE-417T	Electromagnetic Waves	C	4 – 0	4
MTH-411T	Probability and Statistics	C	4 – 0	4
XXX-xxxX	Elective-II	E		X
ELE-414P	Electrical Machines-I Lab.	C	0 – 2	1
ELE-415P	Control System Lab	C	0 – 2	1
ELE-416P	Electrical Measurements & Instrumentation Lab	C	0 – 2	1
	Total Credits		**20 - 6**	**23 + X**

Electrical Machines-I
ELE - 411T

L - P
4 - 0

Unit I

Introduction, classification and construction of transformers, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests (polarity test, open circuit test and short circuit test), All day efficiency, Parallel operation, Auto-transformers, Distribution transformers and Power transformers.

Unit II

Construction of three phase transformers, Different types of Connections: Star-Star, Star-Delta, Delta-Star, Delta-Delta, Open delta connection, Scott connection, Phase Conversions(3 phase to 2 phase/ 2 phase to 3 phase), Three winding transformer, Constant Current Transformer, Instrument Transformers (Introduction).

Unit III

Principles of electromechanical energy conversion, Energy balance, Coupling field reaction, Energy conversion in singly excited magnetic field systems and electric systems, Field energy, mechanical force, and co-energy.

Unit IV

Introduction & principle of operation of DC Generators, Construction of DC Generators, Types of DC Generators, e.m.f equation, Types of windings, power stages and efficiency, commutation and armature reaction, characteristics of DC Generators, Applications of DC Generators.

Unit V

Principles of operation of DC Motors, construction of DC Motors, Types of DC Motors, Back e.m.f and Torque equation, torque and speed of DC Motors, characteristics of various types of DC motors, speed control of DC motors, starting and electric braking.

Books Recommended:

1. Electric Machinery by Fitzgerald, Kingslay, Umans
2. Electric Machinery Fundamentals by Chapman
3. Electric Machines by Nagrath and Kothari
4. Electric Machinery and Transformer by Guru, Hiziroglu

Control Systems
ELE-412T

Unit I

Control Systems- examples and classification; Open Loop and closed loop control systems and their differences; Transfer functions; Block diagram representation of systems; Signal flow graphs - Reduction using Mason's gain formula; Models of some Industrial Control Devices and Systems.

Unit II

Standard test signals; Time domain performance of first and second order control systems-time domain specifications of these systems-steady state and transient response, steady state errors and error constants, Introduction to the State variable representation.

Unit III

The concept of stability, BIBO stability, Relation between characteristic equation roots and BIBO stability, Routh-Hurwitz stability criterion, Relative stability analysis, Proportional, Integral, Derivative (P,I,D) Control with characteristics.

Unit IV

Root Locus and Frequency Response Analysis: The Root locus technique and its Construction Principles; Frequency response and Frequency domain specifications; Bode diagrams - Determination of Stability, Phase Margin and Gain Margin from the Bode Diagrams, Nyquist Methods - Determination of Stability, Phase Margin and Gain Margin from the Nyquist Diagrams.

Unit V

Control System Design using Root Locus methods - Relationship between Root Locus and Time Domain – Cascade (Lag, Lead, Lag-Lead, PI, PID) and Feedback (PD) compensation using Root Locus plots; Compensator design using Bode plots - Cascade (Lead, Lag, Lag-Lead, PI, PID) and Feedback (PD) compensation.

Books Recommended:

1. Control Systems Engineering by Norman S. Nise, John Wiley and Sons.
2. Control Systems–Principles and Design by M. Gopal, Tata McGraw-Hill Ltd.
3. Design of Feedback Control Systems by R. Stefani, C. Savant B. Shahian & G. Hostetter, Saunders College Publishing, 3rd edition.
4. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd.

Electrical Measurements & Instrumentation
ELE - 413T

L - P
4 - 0

UNIT I

Units, dimensions, classification of errors, accuracy and precision, statistical analysis of errors, standards for measurement, temperature, emf, resistance, current, inductance, capacitance methods of measurements, Classification of instruments- absolute, secondary, indicating, recording, integrating.

UNIT II

Instruments for voltage and current measurement, control, balancing and damping forces of instruments, D Arsonval galvanometer- construction and operation, PMMC (Permanent magnet moving coil), moving iron, dynamometer type instruments, Electrostatic and induction type instruments, Use of rectifier for measuring instruments.

UNIT III

Extension of range of voltmeter and ammeter, Current transformer (CT) and Potential transformer (PT) - theory, ratio and phase angle error, design considerations, characteristics, effect of power factor, secondary burden, Industrial current sensors (Hall Effect).

UNIT IV

Power in ac circuits, construction and operation of dynamometer and induction type wattmeter, Measurement of power using wattmeter for single phase circuits and three phase circuits, Measurement of reactive power.

UNIT V

Measurement of energy- single phase induction type watt-hour meter and clock meters, Polyphase watt-hour meters, AC energy meter testing, Meters for special purposes- prepayment meters, maximum demand indicator, power factor meter, frequency meter and synchroscope.

Books Recommended

1. Electronic Instruments and Measurements by W. D. Cooper & A. D. Helfric, Prentice Hall of India, New Delhi.
2. Electrical Measurements and Measuring Instruments by E. W. Golding and F. C. Widdis, JOBS Publications.
3. A Course in Electrical and Electronic Instruments and Measurements by A.K. Sawhney, Dhanpat Rai and Sons, Delhi.

Electromagnetic Waves
ECE- 417T

L - P
4 - 0

UNIT I

Electromagnetic theory (Vector Analysis): Review of Vector-Analysis, Concept of scalar and vector fields, Geometrical and Physical interpretation of Gradient, Divergence and Curl, Continuity Equation.

Co-ordinate systems: Cartesian, Polar, Cylindrical and Spherical polar co-ordinate systems, representation of curl gradient and divergence in different co-ordinate systems, Gauss Divergence Theorem, Stokes Theorem, Green's Function and Dirac Delta Function, Tutorial Problems.

UNIT II

Electrostatic fields: Introduction, Coulomb's law of force, Electric field intensity—Electric field due to a system of charges, field due to sheet of charge, field due to continuous volume charge, electric flux density: Gauss law and its applications; Electrostatic potential; Poisson's equation and Laplace Equation; capacitors and capacitances; energy associated in electrostatic fields; Dielectrics in static electric field, Boundary conditions for electrostatic fields.

UNIT III

Magneto-static fields: Introduction, Biot-Savart's law or (Ampere law for forces); Magnetic flux density, Magnetic field intensity, Ampere Circuital Law, magnetic scalar and vector potential, Inductor, magnetic induction and Faraday's law.

Time-varying fields: Review of Maxwell's equations, Boundary conditions, Time varying field equations, Solution of wave equation in free space.

UNIT IV

Electromagnetic waves: Introduction, wave equation for conducting media, uniform plane wave propagation, wave propagation in lossless and conducting mediums; wave propagation in good conductors, Skin depth penetration, wave propagation in good dielectrics, wave polarization, reflection and refraction of plane waves at plane Boundary (perfect conductor-normal incidence), Poynting vector and Poynting theorem.

UNIT V

Wave Guides: Introduction to Wave Guides, Electromagnetic Waves between Parallel Conducting Planes, the TEM Solution, TE Waves, TM Waves.

Books Recommended:
1. Introduction to Electromagnetics by Griffith
2. Theoretical Physics Vol-II by Constant
3. Electromagnetic field and waves by Corson & Lorrain

Probability and Statistics
MTH - 411T

UNIT I

Statistics: Measures of central tendency and Measures of variations (Dispersions), Moments, Measures of Skewness and Kurtosis, Moment generating functions, problems.

UNIT II

Probability: Random experiment, sample space, events, classical, statistical and axiomatic definitions of probability, Statements and proof of theorems on addition and multiplication of probabilities, problems.

UNIT III

Conditional Probability: Baye's theorem on conditional probability, Random variables, Derivation of formulae for mean, variance and moments of random variables for discrete and continuous cases, Laws of expectation problems, Problems.

UNIT IV

Standard Distributions: Binomial, Poisson and Normal Distributions, Beta and Gamma Distribution, t-Distribution, F-Distribution, Chi-square Distribution and their applications.

UNIT V

Method of Least Squares & Correlation: Methods of least squares, fitting of straight line and parabola of degree 'p', Regression and Correlation, Multiple and Partial Correlation, Problems.

Books Recommended:
1. Fundamentals of Mathematical Statistic by S.C. Gupta and V.K. Kapoor, Sulltan Chand & Sons New Delhi.
2. Statistical Theory and Methodology in Science & Engineering by Brownlee, John Wiley & Sons.
3. Introduction to Mathematical Statistics by R.E. Walpole New York Macmillan publication.
4. Data Analysis for Scientists & Engineers by Meyer, John Wiley & Sons.

Elective-II

XXX-xxxX

Electrical Machines-I Laboratory
ELE – 414P

L - P
0 - 2

List of Experiments:

Experiments on Transformers

1. To perform open circuit and short circuit tests on a single-phase transformer
2. To perform polarity test on a single phase transformer
3. To determine the efficiency and voltage regulation of a single phase transformer
4. To perform Sumpner's test on two identical transformers
5. To study three phase connections on a bank of three single phase transformers

Experiments on Direct Current Machines

1. To study various parts of a dc machine and draw sketches of the same.
2. To plot the saturation curve of a dc machine.
3. To plot the external characteristics of a separately excited dc generator.
4. To study the voltage build up of a dc shunt generator.
5. To plot the external characteristic of a dc shunt generator and compare the characteristics with that of a separately excited generator.
6. To plot the external characteristics of a dc series generator.
7. To plot the external characteristic of a dc compound generator and compare the characteristics when run as a shunt generator, an over compound generator, a flat compound   generator, an under compound generator and differentially compounded generator.

Control Systems Lab
ELE- 415P

L - P
0 - 2

List of Experiments:

1. To study the performance of Relay control Combination of P, I and D control schemes in a Temperature control system.

2. To study the torque-speed characteristics of an AC servomotor, determine its parameters and evaluate its transfer function.

3. To study the open loop and closed loop step response of first, second and third order simulated linear systems.

4. To study D.C. motor angular position control system, step response studies for various values of forward gain.

5. Study the effect of velocity feedback on the transient and steady state performance of DC motor speed control system.

6. Control System Analysis and Design using MATLAB.

Electrical measurement and Instrumentation Lab
ELE – 416P

L - P

0 - 2

List of Experiments:

1. Calibration of ac voltmeter and ac ammeter.

2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s. value is measured by a multi-meter.

3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.

4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor.

5. Measurement of low resistance by Kelvin's double bridge.

6. Measurement of voltage, current and resistance using dc potentiometer.

7. Measurement of inductance by Maxwell's bridge.

8. Measurement of inductance by Hay's bridge.

9. Measurement of inductance by Anderson's bridge.

10. Measurement of capacitance by Owen's bridge.

11. Measurement of capacitance by De Sautybridge.

12. Measurement of capacitance by Schering bridge