CONTENT(PART-I)

AERONAUTICAL ENGINEERING

FLUID MECHANICS AND HEAT FLOW(3-0)

UNIT I. Fluid properties And Fluid Statics:

Units & Dimensions. Properties of fluids – Specific gravity, specific weight,viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Pascal's law, pressure variation with temperature, density and altitude. Hydrostatic law, piezometer, simple and differential manometers, pressure gauges, total pressure and center of pressure of plane, vertical and inclined surfaces.Buoyancy and stability of floating bodies.

UNIT II.Kinematics and Dynamics:

Stream line, path line, streak line, stream tube. Classification of flows: steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows. One, Two and Three dimensional flows.Continuity equation in 3D flow.Surface and Body forces. Euler's and Bernoulli's equations derivation, Navier–Stokes equation (explanation only). Momentum equation.Minor losses in pipes in series and parallel. Total energy line and hydraulic gradient line.

UNIT III. Flow Measurement:

Flow measurement through Venturimeters and Orifice meter. Flow through notches and weirs, Viscometers, Pitot tube, U tube manometer, Muly tube manometer, Hotwire Anemometers, pressure gauge, velocity measurement in flow, flow through nozzles.

UNIT IV. Similitude and Boundary layer

Similarity laws, distorted models, Laminar flow though circular conduits and circular annuli. Boundary layer concepts.Boundary layer thickness.Hydraulic and energy gradient.Darcy – Weisbach equaition. Friction factor and Moody diagram.

UNIT V. Heat flow

Basic heat transfer process, Steady state conduction through- plan walls, cylindrical wall and spherical wall. Classification of convection heat transfer, Basic Boundary layer heat taransfer aplyied to forced convection, natural convection, Basic laws of radiation heat transfer

TEXT BOOKS:

1. Fluid Mechanics Hydraulics and Hydraulics Machines, Modi & Seth, Standard Publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand &Co..
3. Er. R. K. Rajput, Heat and Mass Transfer, S.Chand &Co..

REFERENCES:

1. Fluid Mechanics, Frank M. White, Tata Mc-Grawhill.
2. Fluid Mechanics, John F.Dauglas, Pearson Educations publishers
3. Fluid Mechanics & Hydraulic Machines, D. Ramadurgaiah, New age publishers2005.

FLUID MECHANICS AND HEAT FLOW LABORATORY(0-0-2)

(Common to Aeronautical, Automobile, Mech & Prod)

OBJECTIVE

To study the flow measurement and the performance of fluid machinery

LIST OF EXPERIMENTS

1. Calibration of venturimeter
2. Pressure measurement with pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Flow visualization by Heleshaw apparatus
6. Performance test on centrifugal pumps
7. Performance test on reciprocating pumps
8. Determination of Viscosity of a Fluid
9. Conduction through multy layer wall
10. Natural convection

AERO THERMODYNAMICS (3-0)

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UNIT I.BASIC THERMODYNAMICS

Systems,Zeroth Law,FirstLaw-Heat and worktransferin flow, Second law,Clausiusstatement - concept of entropyentropy change in non-flow processes.

UNIT II.AIR CYCLES

Otto,Diesel,Dualcombustion and Brayton combustion cycles – Airstandard efficiency-Meaneffective pressure – Actual and theoretical PV diagramsof two stroke andfourstroke IC Engines, cycle for Jet propulsion and Rocket Propusion.

UNIT III.THERMODYNAMICS OF ONE DIMENSIONAL FLUID FLOW

Applicationofcontinuity,momentumandenergyequations-RankinecycleIsentropic flowof idealgasesthroughnozzles-Simplejetpropulsionsystem-Thrustrocketmotor– Specific impulse.

UNIT IV.REFRIGERATION AND AIR COMPRESSORS

Principles of refrigeration,Airconditioning -Heatpumps-Vapourcompression - Vapourabsorption types - Coefficient of performance,. Classificationand working principleof compressors

UNIT V.STOICHIOMETRY, FUELS AND COMBUSTION

Basic of Stoichiometry in chemical reaction, Limiting reactant, exess rectatnt, Clasification of fuels, Combustion reaction, fuel-air ratio, Aplication of Stoichiometry in combustion calculation

TEXT BOOKS

1. Rathakrishnan,E,"FundamentalsofEngineeringThermodynamics",Prentice–Hall, India, 2000
2. Nag.P.K.,"EngineeringThermodynamics",Tata McGraw-HillsCo.,Ltd.,Seventh Edn.,1993
3. Yunus A.Cengal. "Thermodynamics an Engineering Approach", Tata McGraw-HillCo. Ltd., 3rd Edition, 2002.
4. D. P. Mishra, Fundamentals of Combustion, Prentice Hall of India, New Delhi, revised edition, 2010.
5. Ganesan, Internal Combustion Engines, Tata McGraw-HillsCo

REFERENCES

1. Mayhew,A.andRogers,B.,"EngineeringThermodynamics",LongmanGreen& Co. Ltd., London, E.L.B.S.Edition,1990.
2. Van Wylen,G.J. andSonntag,R.E.,"Fundamentalsof ClassicalThermodynamics (S.I.Version)", Second Edition, 1986.
3. Bacon, D.H., "Engineering Thermodynamics", Butterworth & Co., London, 1989.
4. D. P. Mishra, Engineering Thermodynamics, Cengage Learning India Pvt. Ltd, 2011.

AERO ENGINEERING LABORATORY (0-0-2)

OBJECTIVE

To enhance the basic knowledge in applied thermodynamics

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of heating value of a fuel
6. COP test on a vapour compression refrigeration test rig
7. COP test on a vapour compression air-conditioning test rig
8. Determination of specific heat of solid
9. Determination of Thermal Conductivity of solid.
10. Determination of Thermal Resistance of a Composite wall.

STRENGTH OF MATERIALS(3-0)

UNIT I.BASICS AND AXIAL LOADING

Stress and Strain–Hooke'sLaw–Elastic constants and their relationship–Statically determinate cases-statically indeterminate cases–composite bar.Thermal Stresses–stresses due to freely falling weight.

UNIT II.STRESSES IN BEAMS

Shear force and bending moment diagrams for simply supported and cantil everbeams-Bending stresses in straight beams-Shear stresses in bending of beam swith rectangular, I& T etc cross sections-beams of uniform strength

UNIT III.DEFLECTION OF BEAMS

Double integration method–McCauley'smethod-Areamoment method–Conjugate beam method-Principle of super position-Castigliano's theorem and its application

UNIT IV.TORSION

Torsionofcircularshafts-shearstressesandtwistinsolidandhollowcircularshafts–closely coiled helical springs.

UNIT V.BI AXIAL STRESSES

Stresses in thin circular cylinder and spherical shell under internal pressure–volumetric Strain. Combined loading – Principal Stresses and maximum Shear Stresses-Analytical and Graphical methods.

TEXT BOOKS

1. NashWilliam – "Strength of Materials", TMH, 1998
2. TimoshenkoS.andYoungD.H.–"ElementsofstrengthmaterialsVol.IandVol. II"., T. Van Nostrand Co-Inc Princeton-N.J.1990.

REFERENCES

1. Dym C.L.and Shames I.H.– "Solid Mechanics", 1990.

STRENGTH OF MATERIALS LABORATORY(0-0-2)

LIST OF EXPERIMENTS

1. Brinell Hardness test
2. Rockwell Hardness test
3. Tensiontest
4. Torsion test
5. Izod Impact test
6. Charpy Impacttest
7. Reverse plate bendingFatigue test
8. Rotating Beam Fatigue test
9. Testing of springs
10. Block Compression Test

ELEMENTS OF AERONAUTICS(3-0)

UNIT IHISTORY OF FLIGHT

Balloon flight–ornithopters early air planes by wright brothers, biplanes and monoplanes, developments in aerodynamics, materials, structures and propulsion over theyears.

UNIT IIBASICS OF FLIGHT MECHANICS

Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, newton‟s law of motions applied to aeronautics-evolution of lift, drag and moment. aerofoils, mach number, maneuvers.

UNIT IIIAIRCRAFT CONFIGURATIONS

Different types off light vehicles, classifications. Components of an airplane and their functions .Conventional control, powered control, basic instruments for flying-typical systems for control actuation.

UNIT IVAIRPLANE STRUCTURES AND MATERIALS

General types of construction, monocoque, semi-monocoque and geodesic constructions, typical wing and fuselage structure. Metallic and non-metallic materials ,use of aluminium alloy, titanium, stainlesssteel and composite materials. Stresses and strains–hooke‟slaw–stress-strain diagrams–elastic constants.

UNITVPOWER PLANTS

Basic ideas about piston, turbo prop and jet engines-use of propeller and jets for thrust productioncomparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

TEXT BOOKS:

1. Anderson, J.D., "Introduction to Flight", McGraw-Hill, 1995
2. Stephen.A.Brandt,"IntroductiontoAeronautics:Adesignperspective"AmericanInstituteof Aeronautics &Astronautics,1997

REFERENCES:

1. Kermode, A.C., "Mechanics of Flight", HimalayanBook, 1997

AVIONICS LABORATORY

List of experiments

Digital Electronics

1. Addition/Subtraction of binary numbers.
2. Multiplexer/Demultiplexer Circuits.
3. Encoder/Decoder Circuits.
4. Timer Circuits, Shift Registers, Binary Comparator Circuits.

Microprocessors

5. Addition and Subtraction of 8-bit and 16-bit numbers.
6. Sorting of Data in Ascending & Descending order.
7. Sum of a given series with and without carry.
8. Greatest in a given series & Multi-byte addition in BCD mode.
9. Interface programming with 4 digit 7 segment Display & Switches & LED's.
10. 16 Channel Analog to Digital Converter & Generation of Ramp, Square, Triangular waveby Digital to Analog Converter.

Avionics Data Buses

11. Study of Different Avionics Data Buses.
12. MIL-Std – 1553 Data Buses Configuration with Message transfer.
13. MIL-Std – 1553 Remote Terminal Configuration.

AVIONICS(3-1-0)

OBJECTIVE

To introduce the basic concepts of navigation & communication systems of aircraft.

UNIT I : INTRODUCTION TO AVIONICS

Need for Avionics in civil and military aircraft and space systems – Integrated Avionicssystem – Typical avionics sub systems – Design approaches and recent advances - Application Technologies.

UNIT –II : FLIGHT DECK AND COMMUNICATION SYSTEMS

Flight deck display technologies – CRT, LED, LCD, Touch screen – Head up display – Electronic instrumentation systems. Aircraft audio systems basic – audio transmitter and receiver principles – VHFcommunication system – UHF communication systems.

UNIT III : DIGITAL AVIONICS ARCHITECTURE

Avionics system architecture– salient features and applications of Data buses MIL–STD1553 B–ARINC 429–ARINC 629

UNIT-IV: RANGING AND POSITIONG SYSTEMS

VHF Omni range – VOR receiver principles – distance maturity equipment –principles of operation – Instrument landing system – localizer and glide slope. Global positioning system principles – triangulation – position accuracy –applications in aviation.

UNIT V : AUTO FLIGHT SYSTEM

Automatic flight control systems – fly by wire and fly by light technologies –flight director systems – flight management systems- Utility systems Reliability and maintainability - Certification

TEXT BOOKS

1. Elements of electronic navigation, N.S.Nagaraja, Tata Mc Graw Hill, 1995.
2. Avionic systems Operation and maintenance, Janes W.Wasson,Jeppesen Sandersen Training products (Sterling Book House, Mumbai),1994.

REFERENCES

1. Introduction to Avionics, Dala R. Cundy, Rich S. Brown, Parson
2. Principle of Avionics, Albert Hel frick, Avionics Communications Inc., 2000.
3. Aircraft Instrumentation and Integrated systems EHJ Pallet, Longman
1. Scientific Technical (Sterling Book House, Mumbai) 1996.
4. Aircraft Radio Systems, J.Powell, Pitman publishers, 1998.
5. Avionics Narigation System, Kayton, 2/e, Yes Dee Publication, John Wiley.
6. Introduction to Avionics, Dale R. Cundy, Rick S. Brown, Pearson,H.L.

ENGINEERING ECONOMICS(2-1)

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR
Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing	10

perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	**9**
04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOR

AIRCRAFT RULES & REGULATION- CAR I & II/AIRPORT PLANNING & MANAGEMENT/FLIGHT SCHEDULE & OPERATION

"Will be uploaded soon"

MINOR

ELEMENTS OF AERONAUTICS(3-0)

UNIT IHISTORY OF FLIGHT

Balloonflight–ornithopters early airplanes by wright brothers, biplanes and monoplanes, developments in aerodynamics, materials, structures and propulsion over the years.

UNIT IIBASICS OF FLIGHT MECHANICS

Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, newton "slaw of motions applied to aeronautics-evolution of lift, drag and moment .aerofoils, machnumber, maneuvers.

UNIT IIIAIRCRAFT CONFIGURATIONS

Different types off light vehicles, classifications. components of an airplane and their functions. Conventional control, powered control, basic instruments for flying-typical systems for controlactuation.

UNIT IVAIRPLANE STRUCTURES AND MATERIALS

General types of construction, monocoque, semi-monocoque and geodesic constructions, typicalwingandfuselagestructure.metallicandnon-metallicmaterials,useofaluminiumalloy,titanium,stainlesssteelandcompositematerials.stressesandstrains–hooke"slaw–stress-straindiagrams–elasticconstants.

UNITVPOWER PLANTS

Basicideasaboutpiston,turbopropandjetengines-useofpropellerandjetsforthrustproduction-comparativemerits,principlesofoperationofrocket,typesofrocketsandtypicalapplications,exploration into space.

TEXT BOOKS:

3. Anderson, J.D., "Introduction to Flight", McGraw-Hill, 1995
4. Stephen.A.Brandt,"IntroductiontoAeronautics:Adesignperspective"AmericanInstituteof Aeronautics &Astronautics,1997

REFERENCES:

2. Kermode, A.C., "Mechanics of Flight", HimalayanBook, 1997

AUTOMOBILE ENGINEERING

MECHANICS OF SOLID

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE - I (10 Lectures)

1. Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads,
   Analysis of Axially Loaded Members : Composite bars in tension and compression - temperature stresses in composite rods, Statically indeterminate problems.
   Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.
2. Members in Biaxial State of Stress :
   Stresses in thin cylinders, thin spherical shells under internal pressure - wire winding of thin cylinders. Analysis of Biaxial Stress.Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress.

MODULE - II (11 Lectures)

3. Strain Deformation :
   Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain measurements, Calculation of principal stresses from principal strains.
4. Shear Force and Bending Moment for Simple Beams
   Shear force and bending moment. Types of load and Types of support. Support reactions, Relationship between bending moment and shear force, Point of inflection. Shear Force and Bending Moment diagrams.
5. Simple Bending of Beams :
   Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

MODULE - III (8 Lectures)

6. Deflection of Beams :
   Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.
7. Theory of Columns:
   Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

MODULE - IV (7 Lectures)

8. Torsion in solid and hollow circular shafts, Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.
9. Close - Coiled helical springs.

TEXT BOOKS

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning

REFERENCE BOOKS

1. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
3. Mechanics of Materials by William F.Riley, Leroy D.Sturges and Don H.Morris, Wiley
    1. Student Edition
4. Mechanics of Materials by James M. Gere, Thomson Learning
5. Engineering Machanics of Solids by Egor P. Popov, Prentice Hall of India
6. Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
7. Strength of Materials by R.Subramaniam, Oxford University Press
8. Strength of Materials by Sadhu Singh, Khanna Publishers

MECHANICS OF SOLID LABORATORY

Practical L/T/P (Hours per week): 0/0/2, Credit: 1

Laboratory Experiments (Minimum 8 experiments)

1. Determination of tensile strength of materials by Universal Testing Machine
2. Determination of Impact strength of material
3. Determination of Hardness strength of materials
4. Determination of Rigidity modulus of material
5. Determination of Compression / Bending strength of material
6. Determination of Fatigue strength of material
7. Evaluation of Engineering Stress / Strain Diagram on Steel rod, Thin and Twisted Bars under tension.
8. Estimation of Spring Constant under Tension and Compression.
9. Double shear test in U.T.M.
10. Load measurement using Load indicator, Load coils.
11. Strain measurement using Rosette Strain Gauge.
12. Stress measurement using strain rosette.

INTRODUCTION TO PHYSICAL METALLURGY &ENGINEERING MATERIALS

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE-I (08 Lectures)

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

MODULE-II (08 Lectures)

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystalization and grain growth; hot working.

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

MODULE-III (10 Lectures)

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel.

T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

MODULE-IV (10 Lectures)

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Glass fiber reinforced plastics, Carbon fibre reinforced plastics, fibre reinforced plastics, Laminated plastic sheets. Tefnol, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

Text Books:

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
3. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.

Reference Books

1. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
2. Physical Metallurgy: Principles and Practice by Ragahvan, PHI
3. The Science and Engineering of Materials by Donald R. Askeland and Pradeep P Phule, Thomson Learning (India Edition)
4. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
5. Essentials of Material Science and Engineering by Donald R. Askeland and Pradeep P Phule, Thomson Learning
6. Processes and Material of manufacture by Lindberg, PHI.
7. Elements of Materials Science & Engineering by Van Vlack, Pearson
8. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
9. Materials Science and Metallurgy By Daniel Yesudian, Scitech
10. Material Science and Metallurgy by C.K.Dutta, Dhanpat Rai
11. Materials Science and Metallurgy by R.B.Choudhary, Khanna Publishers
12. Principles of Engineering Metallurgy by L.Krishna Reddy, New Age International
13. Material Science and Processes by S.K.Hazra Chowdhury, Indian Book distributing Co.
14. Engineering Materials, Properties and Selection by Kenneth G. Budinski and Michael K. Budinski, Prentice Hall of India
15. Materials Science by M.S. Vijaya , G.Rangarajan, TMH
16. Materials Science by V. Rajendra, A. Marikani, , TMH

FLUID MECHANICS AND HYDRAULIC MACHINES

Theory L/T (Hours per week): 3/0, Credit: 3

Module I (12 Lectures)

Introduction: Scope of fluid mechanics and its development as a science
Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Module II (12 Lectures)

Fluid kinematics: Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,

Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

Fluid dynamics : Introduction,Introduction to N-S equation, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.

Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Module III (10 Lectures)

Hydraulic turbines: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine.

Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation

Module IV (06 Lectures)

Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

Text Books

1. Fluid Mechanics, A.K.Jain, Khanna Publishers
2. Fluid Mechanics and Hydraulic Machines, Modi & Seth
3. Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, TMH
4. Fluid Mechanics and Machinery, Mohd. Kareem Khan, OXFORD

Reference Books:

1. Fluid Mechanics, A.K. Mohanty, PHI
2. Introduction to Fluid Mechanics, Fox, McDonald, Willey Publications
3. Fluid Mechanics by Kundu, Elsevier
4. An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge University Press
5. Engineering Fluid Mechanics by Garde et. al., Scitech
6. First course in Fluid Mechanics by Narasimhan, University press
7. Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, PearsonEducation
8. Fluid Mechanics and Machines, Sukumar Pati, TMH

Practical (Hours per week): 2, Credit: 1

Laboratory Experiments (Minimum 8 experiments)

1. Determination of Metacentric Height and application to stability of floating bodies.
2. Verification of Bernoulli's Theorem and its application to Venturimeter.
3. Determination of Cv and Cd of Orifices.
4. Calibration of Bourdon Tube Pressure gauge and measurement of pressure using manometers
5. Experiments on impact of Jets
6. Experiments on performance of Pelton Turbine
7. Experiments on performance of Francis Turbine
8. Experiments on performance of Kaplan Turbine
9. Experiments on performance of centrifugal pump
10. Experiments on performance of reciprocating pump
11. Experiments on Reynold's Apparatus
12. 12 Experiments on Flow through pipes
13. Experiments on Flow through Annulus Double pipe
14. Experiments on Flow through Mouth Piece
15. 15 Experiments on Flow through notch
16. Experiments on performance of Gear pump
17. Verifications of momentum equation
18. Verifications of stokes apparatus

AUTOMOTIVE THERMODYNAMICS

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I (10 hours)

1. Laws of Thermodynamics:first law analysis of steady and unsteady flow, control volumes, Second Law of Thermodynamics, Entropy generation, Reversible work, Availability, and Irreversibility.

2. Gas Power cycle: Air standard cycles- Otto, Diesel, Dual Combustion and Brayton cycles, The Brayton cycle with non-isentropic flow in compressors and turbines, The Brayton cycle with regeneration, reheating and intercooling, ideal jet propulsion cycle.

Module-II (08 hours)

3. Vapour Power cycle:The Carnot vapor cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, Brief concepts of the binary vapour cycle, the gas-vapor coupled cycles, Cogeneration (Back pressure and Pass-out turbines).

Module- III (10 Hours)

4. Air Compressors:
   Introduction (Uses of compressed air), The reciprocating cycle, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors. Centrifugal and axial flow compressor, blowers and fans: Components, working principles and applications.
5. Refrigeration and Air conditioning:
   Principles of refrigeration, Vapour compression and vapour absorption system, COP, properties of refrigerants, Psychrometry, Type of air conditioning systems.

Module- IV (08 Hours)

6. Fuels and Combustion: Fuels: solid, liquid and gaseous, Chemical equations – conservation of mass, First law applied to combustion process, calorific value of the fuel, efficiency of combustion processes, limitations of thermodynamic analysis. Alternative fuels for automobiles

Text Books

1. Basic and Applied thermodynamics, P.K.Nag, TMH publications
2. Engineering Thermodynamics: R.K.Rajput, S. Chand and Co
3. Engineering Thermodynamics by Chattopadhyaya, Oxford
4. Fundamentals of Engineering Thermodynamics, E. Rathakrishnan (PHI)

References

1. Engineering Thermodynamics, Mayhew A and Rogers B, Longman Green and Co Ltd., ELBS Edition, 1990 Reference
2. A course in Thermodynamic and Heat Engine: Kothandaraman and Domkundwar, Dhanpat Rai publication
3. . Applied Thermodynamics: P.L.Balany, Khanna publications

AUTOMOTIVE THERMODYNAMICS:0/0/2

Practical (Hours per week): 2, Credit: 1

Laboratory Experiments: (Minimum 8 experiemts)

1. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
2. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.
3. Study of steam power plant.
4. Study of refrigeration system.
5. Study of gas turbine power plant.
6. Performance analysis of reciprocating air-compressor.
7. Performance analysis of Centrifugal / Axial Flow compressor.
8. Determination of performance characteristics of gear pump.
9. Measurement of steam quality using calorimeter
10. Verification of Joule-Thomson coefficient.

BASIC MANUFACTURING PROCESS

Theory L/T (Hours per week): 3/1, Credit: 4

Module - I (10 Lectures)

1. Foundry :
    a. Types of patterns, pattern materials and pattern allowances.
    b. Molding Materials - sand molding, metal molding, investment molding, shell molding.
    c. Composition of molding sand, Silica sand, Zircon sand, binders, additives, Binders - clay, binders for CO_2 sand, binder for shell molding, binders for core sand.
    d. Properties of molding sand and sand testing.
    e. Melting furnaces - cupola, resistance furnace, induction and arc furnace.
    f. Solidification of castings, design of risers and runners, feeding distance, centre line freezing resistance chills and chaplets.
    g. Degasification and inoculation of metals.
    h. Casting methods like continuous casting, centrifugal casting, disc casting.
    i. Casting defects.

Module – II (8 Lectures)

2. Welding and cutting: Introduction to gas welding, cutting, Arc welding and equipment's. TIG (GTAW) and MIG (GMAW) welding, resistance welding and Thermit welding. Weldablity
   Modern Welding methods like plasma Arc, Laser Beam, Electron Beam, Ultrasonic, Explosive and friction Welding, edge preparation in butt welding.
   Brazing and soldering, welding defects.
   Destructive and non-destructive testing of castings and welding.

Module – III (08 Lectures)

3. Brief introduction to powder metallurgy processes.
4. Plastic deformation of metals: Variables in metal forming and their optimization. Dependence of stress strain diagram on Strain rate and temperature. Hot and cold working of metals, classification of metal forming processes.
5. Rolling: Pressure and Forces in rolling, types of rolling mills, Rolling defects.
6. Forging: Smith Forging, Drop and Press forging, M/c forging, Forging defects.

Module – IV (08 Lectures)

7. Extrusions: Direct, Indirect, Impact and Hydrostatic extrusion and their applications, Extrusion of tubes.
8. Wire drawing methods and variables in wire-drawing, Optimum dies shape for extrusion and drawing.
9. Brief introduction to sheet metal working: Bending, Forming and Deep drawing, shearing.
10. Brief introduction to explosive forming, coating and deposition methods.

Text Books

1. Manufacturing technology by P.N.Rao, Tata McGraw Hill publication.
2. Welding Technology by R.A. Little, TMH
3. Manufacturing Science by A.Ghosh and A K Malick, EWP

Reference Books

1. Fundamentals of metal casting technology by P.C. Mukherjee, Oxford PIBI.
2. Mechanical Metallurgy by Dieter, Mc-Graw Hill
3. Processes and Materials of Manufacture by R.A Lindberg, Prentice hall (India)
4. A Text Book of Production Engineering by P.C.Sharma, S.Chand

BASIC MANUFACTURING PROCESS:0/0/2

Practical (Hours per week): 2, Credit: 1

FOUNDRY AND CASTING

Pattern making, pattern material, pattern allowances, types of pattern, moulding tools, green sand moulding, gating, riser and core.Any two moulds to be given as exercises (solid with core, flange, gear).

Casting demonstrations.

LATHE

Parts of a lathe, exercise on facing, turning, step turning, taper turning, threading, knurling.

BASIC EXERCISES ON ANY THREE OF THE FOLLOWING MACHINES

1. Shaper - Cube and V Block.
2. Drilling - Drilling and Tapping.
3. Milling - Making a square block.
4. Grinding - Surface grinding on a plate.
5. Slotting - Making a rectangular slot.

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR
Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.	9

Leadership: Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS SUBJECT

APPLIED MATHEMATICS*(L/T: 4/0, Credit: 4)*

Module-I (15 Hours)

Probability:
Probability, Random variables, Probability distributions, Mean and variance of distribution, Binomial, Poisson, and Hyper-geometric distributions, Normal and exponential distribution, Distribution of several random variables.

Statistics:
Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis, Acceptance sampling, Regression Analysis, Fitting Straight Lines, Correlation analysis

Module-II (15 Hours)

Partial Differential Equation:
Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation
The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates.

Module-III (08 Hours)
Complex Analysis:
Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,
Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Module-IV (06 hours)
Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

Text books:
1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
2. B.V. Ramana, " Higher Engineering Mathematics", Tata McGraw Hill

Reference books:

1. E.B. Saff, A.D.Snider, " Fundamental of Complex Analysis", Third Edition, Pearson
2. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
3. P. V.O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi
4. Mathematical Methods by Potter Goldberg Publisher: PHI

MINOR SPECIALIZATION
AUTOMOTIVE ENGINES *(3-1-0)*

Module I -Introduction a: - (8 hours)

Classification of I.C Engines, two stroke petrol and diesel engines construction, working and port timing diagrams, four stroke petrol and diesel engines-construction, working and valve timing diagram, comparison of two stroke and four stroke engines, differences between petrol and diesel engines, firing order.

Module II-Fuel supply systems-(8hours)

fuel supply system for SI engines- carburettors (simple and solex), fuel supply system for CI engines- fuel filter, fuel pump and injector, calculation of air fuel ratio for petrol and diesel, air fuel ratio for modern automotive vehicles .

Module III-Lubrication, cooling systems and performance: - (12hours)

Function of lubrication systems, types of lubrication systems- mist, wet and dry sump lubrication systems, properties and designation of lubricants. Need for cooling systems-air and liquid cooling systems-properties of coolants, cooling agents. Performance tests in IC engines and heat balances.

Module IV-Combustion and Power boosters: - (12hours)

Phenomenon of combustion in SI engines, stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, effect of engine variables on knocking, fuel quality for SI engines, octane rating, combustion chambers for SI engines. Phenomenon of combustion in CI engines, stages of combustion, ignition delay, factors affecting delay period, knock in CI engines, comparison of knock in SI and CI engines, direct and indirect injection diesel engines, combustion chambers, supercharging and turbocharging methods.

Text Books:

1. Ganesan . V, “Internal Combustion Engines”, Tata-Mc Graw Hill Publishing Co., New Delhi, 1994.
2. Ramalingam .K. K, “Automobile Engineering”, Sci-tech publication Pvt. Ltd, 2005.

Reference books:

1. Heywood, Internal Combustion Engines
2. Obert E .F, Internal Combustion Engine Analysis and Practice, International Text Book Co., Scranton, Pennsylvania , 1988.
3. Heldt P.M, High Speed Combustion Engines, Oxford IBH Publishing Co, 1964.
4. Dicksee .C.B, Diesel Engines, Blackie and Son Ltd, London, 1964.
5. Malvee V.M, Diesel Engine Operation And Maintenance, McGraw Hill, 1974.

BIOMEDICAL ENGNEERING

HUMAN ANATOMY

Theory L/T (Hours per week): 3/0, Credit: 3

Module -I

Skeletal system: Types of bones, classification, Structure of bone, blood supply, Bones of appendicular And axial skeleton. Cartilage: Type, Structure in brief.

Joints: Classification, structure of synovial joint, major joints of the limbs, temporomandibular joint, atlanto-axial joint- in brief.

Muscle tissue: Types, structure of skeletal muscle in brief, types of muscles, major muscle of the limbs and their actions.

Module-II

Head and Neck

Neck: Anatomical triangles in neck, Scalp layers, Brain: parts of brain, brain stem, ventricles, CSF, meninges, cranial nerves, (names and functions only).

Spinal cord: Gross feature and structure in brief, spinal nerves, major nerve plexus in the body, and their branches, nerve ending and receptors.

Respiratory systems: Parts of upper respiratory tract, Lower respiratory tract,Lungs and bronchopulmonary segments.

Module-III

Heart: Structure of heart, Pericardium, Chambers, Blood supply (in brief), Major arteries and veins of the body

Lymphatic systems: Spleen: Organs in brief.

G.I.Tract: Oesophagus, Stomach, Intestines, Liver and biliary tract, Pancreas.

Genitourinary system: Kidneys, Ureters, Urinary bladder, Male and female reproductive organs- in brief.

Endocrine glands: Pituitary glands, Thyroid gland, Parathyroid glands, Endocrine pancreas, Renal medulla- in brief

Reference Books:

1. Anatomy and Physiology – Ross &Wilson , Churchill Livigstone publications.
2. Charles E.Tobin,Basic Human Anatomy,McGraw Hill,1980
3. Best and Taylor,The Living Body;B.I Publication,1980.
4. C. Tandan & Dr. Chandhramoli;Textbook of physiology for Dental studies.Dorpan Publications.
5. Gorden Sears, W.S & Winwood W.S;Anatomy& Physiology for Nurses,Revised edition.
6. Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition

HUMAN ANATOMY LAB

1. Identification of various organs system wise (GI system, CV system, Pulmonary system, Genitourinary system, Head and neck) from charts and models.
2. Identification of skeletal parts from human skeleton and charts.
3. Morphometric study of human skull, sternum, pelvis and femur from CT Scan Images,
4. Preparation of slices from tissue, fixation and examination under microscope,
5. Preparation of blood film, staining and examination under microscope, TLC, DLC estimation of blood,
6. Recording respiratory parameters through spirometry
7. Examination of eye structures with direct Ophthalmoscope

NETWORK THEORY

Theory L/T (Hours per week): 3/0, Credit: 3

Module- I (10 Hrs) : **Network Topology**: Graph of a network; Concept of tree; Incidence matrix; Tie-set matrix; Cut-set matrix; Formulation and solution of network equilibrium equations on loop and node basis.
Network Theorems & Coupled Circuits: Substitution theorem; Reciprocity theorem; Maximum power transfer theorem; Tellegen's theorem; Millman's theorem; Compensation theorem; Coupled Circuits; Dot Convention for representing coupled circuits; Coefficient of coupling.

Module- II (08 Hrs) : **Laplace Transform & Its Application**: Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).

Module- III (08 Hrs) : **Two Port Network Functions & Responses**: z, y, ABCD and **h**-parameters; Reciprocity and Symmetry; Interrelation of two-port parameters, Interconnection of two-port networks; Network Functions; Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

Module- IV (08 Hrs) : **Fourier Series and Fourier Transform**: Fourier series, Fourier analysis and evaluation of coefficients; Steady state response of network to periodic signals; Fourier transform and convergence; Fourier transform of some functions; Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.

Additonal Module (Terminal Examination-Internal) (08 hours)

1. **Network Synthesis**: On network synthesis.

Text Book(s)

1. Network Analysis, M E Van Valkenburg, PHI, third edition.
2. Fundamentals of Electric Circuits, Charles K Alexander & Mathew N.O. Sadiku, Tata McGraw Hill, fifth edition.

Reference Book(s)

1. Network Theory, Smarajit Ghosh, PHI, first edition(2005)
2. Network Theory, P K Satpathy, P Kabisatpathy, S P Ghosh and A K Chakraborty Tata McGraw Hill, New Delhi.
3. Fundamentals of Network analysis and Synthesis, K.M.Soni, S.K.Kataria and Sons (2010) ninth edition
4. Network Analysis and Synthesis, Franklin F. Kuo ,Wiley Student Edition, second edition 2006

NETWORK THEORY LAB

List of Experiments:

(At least 8 out of 10 experiments should be done)

1. Verification of Network Theorems (Superposition, Thevenin, Norton, Maximum Power Transfer).
2. Study of DC and AC Transients.
3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
4. Determination of circuit parameters: Hybrid and Transmission parameters.
5. Frequency response of Low pass and High Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series circuit.
9. Study of resonance in R-L-C parallel circuit.
10. Spectral analysis of a non-sinusoidal waveform.

ANALOG ELECTRONICS CIRCUIT

Theory L/T (Hours per week): 3/0, Credit: 3

Module – I (12 Hours)

MOS Field-Effect Transistor: Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. **(4 Hours)**

Biasing of BJTs: Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples**.** **(4 Hours)**

Biasing of FETs and MOSFETs: Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design **(4 Hours)**

MODULE – II (12 Hours)

Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of R_S and R_L on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits. **(6 Hours)**

Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of R_{SIG} and R_L on CS Amplifier; Source Follower and Cascaded System. **(6 Hours)**

MODULE – III (5 hours)

High Frequency Response of FETs and BJTs: High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (**5 Hours)**

MODULE – IV (9 hours)

Feedback amplifier and Oscillators: Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits.**(4 Hours)**

Operational Amplifier: Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. **(5Hours)**

Additional Module (Terminal Examination-Internal) (6 hours)

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and μA 741, Signal Generators using OPAMP: Square, triangle and ramp

generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

Text Books

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9th/10th Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2nd Edition,2008.

Reference Books

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5th Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2nd Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5thedition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009
8.

ANALOG ELECTRONIC CIRCUIT LAB

List of Experiments:

(At least 10 out of 12 experiments should be done)

1. Design and simulate BJT bias circuit and compare the results.
2. Design and simulate JEET/MOSFET bias circuit and compare the results.
3. Design and simulate BJT common-emitter circuit and compare D.C and A.C performance:
4. Design and simulate JFET/MOSFET common-emitter circuit and compare D.C and A.C performance:
5. Determining the frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response and compare with simulated results.

6. Differential amplifiers circuits: D.C bias and A.C operation without and with currentsource.
7. Study of Darlington connection and current mirrorcircuits.
8. OP-Amp Frequency Response andCompensation.
9. Application of Op-Amp as differentiator, integrator, square wavegenerator.
10. Obtain the band width of FET/ BJT using Square wave testing of anamplifier.
11. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/CrystalOscillator.
12. Class A and Class B PowerAmplifier.

ENGINEERING PHYSIOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module-1

1. Basic functional concept of the body as whole & contribution of individual systems & their inter-dependence for achieving the goal.
2. Cell physiology: Ionic currents, Conductance and capacitance properties of excitable membranes, basic idea on cable properties and core conductor theory, transmembrane potential and its determination, equivalent electrical circuit diagram for neural membranes.
3. Nerve physiology: Types of neurons, their electrical properties, electrical potentials, nature, origin and propagation of action potential (AP), EPSPs, IPSPs, and Non- propagatory potentials (Generator Potential, Receptor Potential).
4. Muscle physiology: Types of muscles (functional classification), muscle action potential, EPP, cross bridge cycle and electromechanical coupling during contraction, role of Calcium ions, functional difference between smooth, cardiac and skeletal muscles during contraction, muscles as energy transducer, types of muscle contraction (isotonic, isometric, isokinetic) measurement and characterization (Force-velocity and Load-Tension relationships).

Module – 2

1. Respiratory physiology: Respiratory pathways (upper and lower). Mechanism of respiration, Feedback control, Blood-alveolar gas exchange (O_2 and CO_2) in details
2. Cardiovascular physiology: Vessels and their functional properties, heart as pump. Cardiac cycle, regulation of cardiac pump (extrinsic, intrinsic factors, auto regulation), Starling's Law, cardiac output measurement methods, pacemaker potentials. ECG and formation of normal ECG, cardiac sounds and correlation with ECG.
3. Renal physiology: Nephron structure and functions, counter current exchange mechanism. Voiding of urine, Reflex Control, Bladder Plasticity and Urine Volume relationship.

4. Heat equilibrium in body: Heat equilibrium equation, temperature regulation and role of hypothalamic thermostat, responses to cold and warm environment, thermo neutral range & lethal Temperature concepts.
5. Haematology: Blood as Newtonian fluid –Its physical properties, mechanism of homeostasis, intrinsic and extrinsic pathways, blood pressure and its measuring techniques, feedback control of BP.

Module -3

1. Hormones: classification, second messenger hypothesis, sources, half-life, effective concentration, feedback control, hypothalamic-pituitary axis, molecular mechanism of peptide & steroids hormones.
2. CNS physiology: Electroencephalography (EEG) – its basic principles. Electro-corticogram (ECOG). Neuro- physiological and Bioelectrical basis of Learning and Memory.
3. General sensation: Receptors. role of transducers, general and specific functional characteristics, classification, receptor potential, generator potential, amplification and propagation to CNS, spinal pathways of common sensations (pressure, touch, pain and temperature) in brief.
4. Special sensation:
    I. Audition: Sound as stimulus. quality of sound, pitch, loudness, SPL, auditory receptor, genesis of potential change in the Internal ear, mechanism of hearing;
    II. Vision: Optics of the eye, camera principles applied to the eye, accommodation and its pathway, refractive errors, Purkinje Shift, Electroretinogram (ERG), and Electrooculogram (EOG).

Reference Books:

1) Concise Medical Physiology By Chauduri
2) Anatomy and Physiology – Ross & Wilson, Churchill Livigstone publications.
3) Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition
4) J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981

ENGINEERING PHYSIOLOGY LAB

1. Blood pressure measurements (SBP, DBP, PP and MPP) using sphygmomanometer and correlation with digital blood pressure measuring device.
2. Microscopy, cell count using Neubabuer chamber or hemocytometer, differential count of blood cells
3. Hb% measurement by Sahil's method and validation by semi-automated biochemical analyser
4. Cell viability assay (MTT assay).
5. EMG: Muscle contraction tracing and NCV measurement by EMG.

6. ECG: Placement of leads, validation and ECG tracing by 12-channel ECG device, concept of HRV.
7. EEG: Placement of leads as per 10-20 international classification, EEG tracing, analysis.

BASIC CLINICAL SCIENCE

Theory L/T (Hours per week): 3/1, Credit: 4

Module I

DIAGNOSTIC INVESTIGATIONS IN NEUROLOGY: Neurodegenerative disorders (Parkinsonism, Alzheimer's disease, SCL), Siezures, mechanism and classifications, Electroencephalography-clinical significance, Applications of computerized axial tomography, carotid angiography and transcranial doppler in neurology, Neuromuscular stimulation, Electromyography: clinical applications, clinical significance, Diseases of neuro-muscular junction, Motor neuron disorders, the electrical study of reflexes, the silent period, The F response, The H reflex, the axion reflexes. Disorders of neuromuscular transmission

Module II

CARDIOLOGY: Review of Heart structure, function and cardiac cycle, various valves and valvulopathies (MR, AR, MS, AS), Prosthetic devices, Cardiac failure and cardiogenic shock, Cardiac output measurement methods, Heart lung machine applications and clinical significance. Cardiorespiratory resuscitation, CVP and SWAN catheters

Electrical properties: Source of ECG potentials, dipole theory, normal and abnormal ECG's, diagnostic applications, interpretation of ECG, Disorders of rate and rhythm: tachycardia and tachyarrhythmias, bradycardia and bradyarrythmia, heart blocks, Cardiacpacing: diagnostic and therapeutic indications, criteria for selection, complications, types of pacing.

CARDIAC ASSIST DEVICES: Diagnostic usage of ultrasound scanners, Doppler ultrasound: measurement and clinical significance, Open heart surgery, grafts, bypass surgery. Instrumentation used for open-heart surgery, Organization of I.C.C.U Clinical aspects.

Module III

PULMONOLOGY: Obstructive respiratory disorders, Restrictive respiratory disorders, humidifiers &nebulizers, metered dose inhalers.

ANAESTHESIA: Anaesthesia machine, Mappleson circuits for breathing, Different kinds of anesthesia, uptake of anesthetic gases and vapors, Pre-anesthetic care and preparation. Post-operative care, Laws of gases, Patient monitoring during surgery. Applications of Ventilators, Infusion Pumps, Syringe Pumps,

Reference Books:

1. James G. Mcleod, Physiological Approach to Clinical Neurology, Butterworth-Heinemann Ltd, 3rd edition.
2. D.Goldstein, mehmet Oz, Cardiac Assist Devices, Blackwell Future, 2002.
3. Robert F Rushmer , Cardio vascular Dynamics.WB Saunders, 1976.
4. Ward's Anaesthesia Equipment – 4th Edition- Edited by C Ward, WB Saunders Company Limited-1992 (or the Latest Edition of the same book)

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR
Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content	10

	Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	**9**
04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONORS
QUANTITATIVE PHYSIOLOGY/RADIOLOGICAL TECHNIQUES

RADIOLOGICAL TECHNIQUES

Module-1

Introduction to surface anatomy (peripheral and visceral landmarks), X-Ray machine: working principle,components, image enhancement parameters and their control;

Module-2

CT Scan: Working principle, components, types of CT; MRI scanner: Working principle, components andimage enhancement parameters; USG Scanner: Working principle, components and introduction to color doppler, PET scan: Working principle;

Module-3

Cardiac Imaging Procedures: cardiac MRI, cardiac CT/PET scan (introduction only); Breast and Women's imaging procedure: DEXA scan, Mammogram and perinatal USG (introduction only); Nuclear Medicine and it's uses.

QUANTITATIVE PHYSIOLOGY:

Module-1

Introduction to Human Physiology; Physical laws governing physiological functions with correlation (Law of Gravitation, Coulomb's Law, Stoke's Law, Hooke's Law, Universal Gas Law, Law of Thermodynamics);

Module-2

System-1 (Musculoskeletal system): Classification of skeletal muscles, estimation of TM potential by

Nernst Equation, AP, EPP, mechanism of skeletal muscle contraction, types of contractions (profile and measurement), mechanism of smooth muscle contraction; System-2 (cardiovascular system): vessels, calculation of lateral wall pressure, heart and its chambers, cardiac output calculation (dye and temperature dilution methods, Fick's method and 2D/3D echocardiographs methods); System-3
(Respiratory system): Lungs and segments, Inspiration and expiration profile by P-V plot; lungs volumes and capacities, measurement of TV by He dilution and N2 washout methods, gaseous exchange system (O 2 and CO 2), calculation of gas exchange across blood-alveolar interface;

Module-3

Nervous System: Pathways of pressure, touch, pain and temperature sensation, pathways for vision,

audition, olfaction and accommodation, pain measurement and peripheral receptors; Fluid system: Acid–base balance of body, calculation and prediction of acidosis and alkalosis

MINOR
ENGINEERING PHYSIOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module-1

5. Basic functional concept of the body as whole & contribution of individual systems & their inter-dependence for achieving the goal.
6. Cell physiology: Ionic currents, Conductance and capacitance properties of excitable membranes, basic idea on cable properties and core conductor theory, transmembrane potential and its determination, equivalent electrical circuit diagram for neural membranes.
7. Nerve physiology: Types of neurons, their electrical properties, electrical potentials, nature, origin and propagation of action potential (AP), EPSPs, IPSPs, and Non- propagatory potentials (Generator Potential, Receptor Potential).
8. Muscle physiology: Types of muscles (functional classification), muscle action potential, EPP, cross bridge cycle and electromechanical coupling during contraction, role of Calcium ions, functional difference between smooth, cardiac and skeletal muscles during contraction, muscles as energy transducer, types of muscle contraction (isotonic, isometric, isokinetic) measurement and characterization (Force-velocity and Load-Tension relationships).

Module – 2

6. Respiratory physiology: Respiratory pathways (upper and lower). Mechanism of respiration, Feedback control, Blood-alveolar gas exchange (O_2 and CO_2) in details
7. Cardiovascular physiology: Vessels and their functional properties, heart as pump. Cardiac cycle, regulation of cardiac pump (extrinsic, intrinsic factors, auto regulation), Starling's Law, cardiac output measurement methods, pacemaker potentials. ECG and formation of normal ECG, cardiac sounds and correlation with ECG.
8. Renal physiology: Nephron structure and functions, counter current exchange mechanism. Voiding of urine, Reflex Control, Bladder Plasticity and Urine Volume relationship.
9. Heat equilibrium in body: Heat equilibrium equation, temperature regulation and role of hypothalamic thermostat, responses to cold and warm environment, thermo neutral range & lethal Temperature concepts.
10. Haematology: Blood as Newtonian fluid –Its physical properties, mechanism of homeostasis, intrinsic and extrinsic pathways, blood pressure and its measuring techniques, feedback control of BP.

Module -3

5. Hormones: classification, second messenger hypothesis, sources, half-life, effective concentration, feedback control, hypothalamic-pituitary axis, molecular mechanism of peptide & steroids hormones.

6. CNS physiology: Electroencephalography (EEG) – its basic principles. Electro-corticogram (ECOG). Neuro- physiological and Bioelectrical basis of Learning and Memory.
7. General sensation: Receptors. role of transducers, general and specific functional characteristics, classification, receptor potential, generator potential, amplification and propagation to CNS, spinal pathways of common sensations (pressure, touch, pain and temperature) in brief.
8. Special sensation:
   III. Audition: Sound as stimulus. quality of sound, pitch, loudness, SPL, auditory receptor, genesis of potential change in the Internal ear, mechanism of hearing;
   IV. Vision: Optics of the eye, camera principles applied to the eye, accommodation and its pathway, refractive errors, Purkinje Shift, Electroretinogram (ERG), and Electrooculogram (EOG).

Reference Books:

1) Concise Medical Physiology By Chauduri
2) Anatomy and Physiology – Ross & Wilson, Churchill Livigstone publications.
3) Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition
4) J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981

BIOTECHNOLOGY ENGINEERING

BIOCHEMISTRY

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I

Structure and Function of Carbohydrates: Monosaccharide, Oligosaccharides, Polysaccharides (Starch, Glycogen, Cellulose), Optical Isomerism

Structure and Function of Lipids: Saturated and Unsaturated Fatty Acids, Triacylglycerols, Phosphoglycerides, Sphingolipids, Waxes and Sterol

Structure and Function of Proteins: 20 Amino acids, Peptide bond, Hierarchy of protein architecture, Ramachandran Plot

Structure and Function of Nucleic Acids: DNA, RNA, Double Helix Model of DNA, Denaturation and Renaturation DNA;

Structure and function of Hormones, Minerals and Vitamins

Module-II

Principle of Bioenergetics: Bioenergetics and Thermodynamics, Phosphoryl group transfer and energy currency-ATP; Biological Oxidation and reduction reactions

Metabolism-I: Introduction to metabolic processes; Metabolism of Carbohydrates: Glycolysis, TCA Cycle, ETS and Oxidative Phosphorylation, Gluconeogenesis ,

Metabolism of Lipids: Anabolism (Saturated), Catabolism (α- Oxidation, β-Oxidation) and Energetics of lipid metabolism;

Metabolism Of Nucleic Acids: Catabolism and anabolism of purine and pyrimidine nucleotides.

Photosynthesis: Light reaction and dark reaction.

Module-III

Metabolism-II: Metabolism of proteins: Biosynthesis of amino acids (role of precursors);

Enzymes: Properties of Enzyme, Classification of Enzymes, Mechanism of enzyme action, Kinetics of enzyme action, Activation energy, Enzyme Inhibition, Coenzyme

Text Book

1. Principle of Bio-Chemistry – Lehinger, Nelson and Cox
2. Biochemistry of Biochemistry by L. Stryer
3. Fundamentals of Biochemistry – Voet & Voet
4. Biochemistry by Zubay.
5. Fundamental of Biochemistry, Jain and Jain

BIOCHEMISTRY LAB

1. Spectrophotometric/Colorimetric estimation of Protein using Lowry's Method
2. Spectrophotometric/Colorimetric estimation of carbohydrates
3. Spectrophotometric estimation of DNA using DPA method
4. Spectrophotometric estimation of RNA using Orcinol Method
5. Estimation of iodine Number and Saponification value of fatty acids
6. Separation of Amino acids by Paper Chromatography
7. Separation of Sugars by Thin Layer Chromatography
8. Separation of Proteins by Column Chromatography
9. Assay of Enzyme activity: Protease from bacteria
10. Assay of Enzyme activity: Amylase from Plant tissue & Saliva
11. Determination of Km and Vmax of an enzyme catalyzed reaction.

Books:

Introduction to Practical Biochemistry, Plummer, Tata McGraw Hill

CELL BIOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I

Structural intricacy & Chemical composition of cells, Organization of Cell (Prokaryotic and Eukaryotic), Cell Wall & Cell Membrane, Cell Organelles, Endoplasmic reticulum, Nucleus, Cytoskeleton

Module-II

Molecular Organization of Chromosome (Nucleosome concept), Cell Cycle, Cell Divisions- Mitosis and Meiosis, Programmed cell death.introduction to cell fate and early embryonic patterning in different organisms (*Drosophila)*, Stem Cell (Embryonic and adult types and characteristics)

Module-III

Membrane transport & trafficking, mechanisms of protein sorting and targeting, intercellular communication and associated signaling pathways, cell death pathways, Cancer Cell Biology (Cause, Cell Characteristics)

Text Books

1. Theory & Problems in Molecular & Cell Biology, Stansfield, Tata McGraw Hill
2. The Cell Molecular approach, Geoffrey M. Cooper, ASM press Washington D.C. Sinauer Associates, Inc.
3. Principles of Genetics, Robert Tamarin, Tata McGraw Hill
4. Molecular Biology of Cell – Alberts, Garland Science, Taylor & Francis Group.
5. Molecular Biology of The Cell (Fifth edition), 2007 by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Publisher: Garland Publications

6. Molecular Cell Biology (sixth edition), 2008 by Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, Hidde Ploegh, Paul Matsudaira. Publisher: W H Freeman & Company
7. Essential Cell Biology (Third Edition), 2009 by Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Publisher: Garland Science

CELL BIOLOGY LAB

1. This Exercise focuses on how to develop a working knowledge of the Microscope and its use. Students should identify the different parts of the Microscope. List and follow recommended procedures in using and caring for the Microscope.
2. Mitosis and the Cell Cycle in Onion Root-Tip Cells
3. Meiotic cell division in grasshopper testis
4. Cell Counting and viability study
5. To isolate the mitochondria from the given sample
6. To identify the blood cell types in human blood smear.
7. To identify the different types cells present in the leaf cross section.
8. To prepare permanent slides using the given sections like Plant and animal samples.
9. Separation of lymphocytes and granulocytes from blood sample
10. To study cellular fractionation of a homogenized rat liver via a technique called differential centrifugation.
11. To study the technical principles underlying Scanning Electron Microscopy (SEM).

BIOSTATISTICS

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I:

Introduction and definition of Biostatistics; Concept of variables in biological systems. Collection, Classification, tabulation graphical and diagrammatic representation of numerical data; Measures of central tendency: Mean, Median and Mode and their relationship; Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Concept of standard error, Coefficient of variation, Skew ness and Kurtosis.

Module-II:

Probability: Random experiment, events, sample space, mutually exclusive events, independent and dependent events; Various definitions of probability, addition and multiplication theorems of probability, Random variables (discrete and continuous), Probability density functions and its properties; Probability distributions: normal, Binomial, Poisson and their application.

Module-III:

Concept of populations and sample.Simple random sampling without replacement. Definition of simple random sample; Designing of Experiments-Random block design and Split plot design; Correlation and Regression, linear and quadratic regression; Analysis of variance: One- way and two-way classifications with single observation per cell. Duncan's multiple range test; Tests of significance: Chi-square, student's t, z and f-distributions, their properties and uses.

Text Books:

1. Biostatistics: Rao KS, Himalaya Publishing House
2. Introduction to Biostatistics & Research Methods: Sundar Rao PSS & Richard J, PHI learning Pvt. Ltd.
3. Biostatistics: Arora and Mohan, Himalaya Publishing House

BIOSTATISTICS LAB

The practical to be conducted with available sample data set.

1. Introduction to biostatistics and measurement.
2. Construct and interpret graphical displays such as histograms, box plots, bar charts, stem & leaf plots, and bivariate scatterplots
3. Collection of sample data and opening sample datasets
4. Calculating measures of central tendency and dispersion.
5. Hypothesis testing; Define null and research hypotheses. Practice conducting and interpreting T-test in Stata and interpreting confidence intervals
6. Hypothesis testing; Define null and research hypotheses. Practice conducting and interpreting ANOVA and interpreting confidence intervals
7. Conduct and interpret correlation
8. Conduct and interpret linear regression
9. Conduct and interpret multiple linear regression
10. To calculate and interpret binomial probabilities and Normal probabilities

MICRO BIOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I

Introduction to Microbial Kingdom- Bacteria, Viruses, Fungi and Yeast; Classical and Modern approaches of microbial taxonomy; Classification of bacteria, fungi and Viruses; Methods of Microbiology- Culture media, Sterilization, Establishment of pure culture, Staining of bacteria (Gram's, Acid Fast, Capsule), Micrometry and Microscopy(Bright Field, Fluorescence, Phase Contrast and Electron).

Module-II

Microbial growth and metabolism: Pattern of bacterial growth, Growth kinetics, Monod's Equation, Synchronous Growth and its Kinetics, Continuous culture and its growth kinetics, Growth inhibitory substances. Metabolism of carbohydrate in bacteria,

Enerdoudorf,s pathway and glyoxalate pathway, Energy transduction mechanism in bacteria, Cyanobacteria and nitrogen fixation, Anaerobic respiration.
Microbial genetics: Organization of bacterial and viral genome, Plasmids and Episomes, Genetic recombination in bacteria (Transformation, Conjugation and Transduction), Genetic analysis in bacteria, DNA repair mechanisms in bacteria, Transposons, Mutation in Microorganisms.

Module-III

Food Microbiology: Microbiology of foods, Types of microbes associated with food spoilage, Food preservation methods, Food poisioning, Microbiology of Milk and dairy products.
Medical Microbiology: disease causing bacteria, virus and fungi; Antimicrobial agents, Antibiotics, Disinfectants and Vaccines
Environmental Microbiology: Microbiology of water, Microbiology of Air, Baceriological analysis of water & water treatment, Microbiology of extreme environments (Halobacteria, Methanogens, Thermofiles), Microbiology of sewage.

Text Books:

1. Text book of Microbiology by Stanier.
2. Microbiology by Pelczar
3. Brock Biology of micro-organisms
4. Microbiology by Presscott.
5. Microbial Genetics- Freifelder
6. Microbiology and Immunology by B K Patnaik, T.C. Kar, H.N. Thatoi, India-Tech publication. New Delhi

MICRO BIOLOGY LAB

1. Micrometry: calibration of stage and ocular micrometer and measurement of microbial sample.
2. Staining of microbial sample (Gram's Staining, Capsule staining, Fungal staining)
3. Media preparation and sterilization (Slant, Stab and Broth culture)
4. Isolation of micro organisms from natural habitats (Air, Water, Soil & Milk)
5. Establishment of pure culture by streak plate and serial dilution method.
6. Study the bacterial growth curve using spectrophotometer and viability assessment.
7. Antibiotic assay and estimation of Zone of inhibition.
8. Chemical assay and MIC determination of antibiotics.
9. Biochemical assay of microorganisms (Starch Hydrolysis, Casein Hydrolysis and IMVIC test).
10. Microscopy: Study of Compound, Phase contrast and Fluorescence Microscopes.

UPSTREAM PROCESS ENGINEERING-I

Theory L/T (Hours per week): 3/1, Credit: 4

Module-I: Fluid Mechanics concept (14 lectures)

Physical properties of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, fluid classification.
Fluid static pressure, Pascal's, pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.
Hydrostatic pressure on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.
Buoyancy and flotation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Module –II: Elements of fluid dynamics (12 lectures)

Basic equations of fluid flow: Newtonian and non-Newtonian fluids, turbulence and its nature, Reynolds number and transition from laminar to turbulent flow, boundary layer flow, continuity equation, Bernoulli's equation, pump workin Bernoulli's equation.
Flow of incompressible fluids: Fluid flow in pipes, friction factor, laminar flow in pipes, Hagen-Poiseuille equation, effect of roughness, friction factor charts, Reynolds number and friction factor relationship
Flow through packed beds: Ergun, Kozney- Carman and Blake-Plummer equations, principles of two-phase and three-phase fluidizaion.

Module-III : Transportation and metering of fluids (10 lectures)

Pipe fittings and valves, positive displacement pumps, power and efficiency of pumps, centrifugal, plunger and piston pumps, blower and compressor, flow measuring devices viz. venture meter, orifice meter, pitot tube and rotameter. Drag force and terminal settling velocity, principles of solid-liquid separation- filters and centrifuges.

Text Books

1. McCabe, Smith and Harriot, Unit Operations of Chemical Engineering
2. Foust et al, Principles of Unit Operations.
3. Treybal, R.E. Mass Transfer Operations
4. Badger and Banchero. Introduction to Chemical Engineering.
5. Foust, Wenzel, Clump, Maus and Andersen, Principles of Unit Operations.
6. Geankoplis, Transport processes and unit operations

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

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03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	9

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

GENETICS (Honours Subject)

Theory L/T (Hours per week): 4/0, Credit: 4

Module-II

Principles of Inheritance: Chromosome theory of Heredity, Mendelism, Non-Mendelian Gene Interactions (Epistasis, Lethality, Pleiotropy), Allelic Complementation, Cytoplasmic Inheritance,

Module-II

Linkage and Crossing over, Chromosome mapping, Mutation and Chromosomal Aberration, Transposable genetic elements, Heterosis and Hybrid vigour, Inbreeding depressions, Genetic diseases in Human (Colour blindness, Haemophillia).

Module-III

Quantitative Inheritance: Polygenes and Multiple alleles, Introduction to QTLs and its inheritance, Detection of QTLs

Principles breeding in plants and animals

Population Genetics: Hardy-Weinberg's law, Genetic Equilibrium, Changes in gene frequency, Genetic Drift, Effect of evolutionary forces on genetic equilibrium of apopulation.

Developmental genetic with reference to Arabidopsis and Drosophilla.

Text Books

1. Theory & Problems in Molecular & Cell Biology, Stansfield, Tata McGraw Hill
2. The Cell Molecular approach, Geoffrey M. Cooper, ASM press Washington D.C. Sinauer Associates, Inc.
3. Principles of Genetics, Robert Tamarin, Tata McGraw Hill
4. Molecular Biology of Cell – Alberts, Garland Science, Taylor & Francis Group.
5. Concept of Genetics by Klug.
6. Genetics, David R Hyde, Tata McGraw Hill.

BIOSTATISTICS (MINOR SUBJECT)

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I:

Introduction and definition of Biostatistics; Concept of variables in biological systems. Collection, Classification, tabulation graphical and diagrammatic representation of numerical data; Measures of central tendency: Mean, Median and Mode and their relationship; Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Concept of standard error, Coefficient of variation, Skew ness and Kurtosis.

Module-II:

Probability: Random experiment, events, sample space, mutually exclusive events, independent and dependent events; Various definitions of probability, addition and multiplication theorems of probability, Random variables (discrete and continuous), Probability density functions and its properties; Probability distributions: normal, Binomial, Poisson and their application.

Module-III:

Concept of populations and sample.Simple random sampling without replacement. Definition of simple random sample; Designing of Experiments-Random block design and Split plot design; Correlation and Regression, linear and quadratic regression; Analysis of variance: One- way and two-way classifications with single observation per cell. Duncan's multiple range test; Tests of significance: Chi-square, student's t, z and f-distributions, their properties and uses.

Text Books:

1. Biostatistics: Rao KS, Himalaya Publishing House
2. Introduction to Biostatistics & Research Methods: Sundar Rao PSS & Richard J, PHI learning Pvt. Ltd.
3. Biostatistics: Arora and Mohan, Himalaya Publishing House

CHEMICAL ENGINEERING

FLUID FLOW AND FLOW MEASUREMENT

Theory L/T (Hours per week): 3/0, Credit: 3

Module I:
Units and dimensional analysis, Types of Fluids.
Fluid Statics: Hydrostatic Pressure, Pressure measuring Devices.
Introduction to fluids in motion, Flow in boundary layers.Its formation & growth in tubes & plates. Basic equations of fluid flow continuity, momentum & Bernoulli's equation. Flow measuring devices: Venturi, Orifice, Pitot tube, and Rotameter.

Module II:
Flow of incompressible fluid in pipes, Relation between skin friction & wall shear. Laminar flow in pipes, Hagen–Poiseuille equation, Friction factor, Friction from changes in velocity or direction, Flow of compressible fluids, Basic equations. Flow past immersed bodies, Drag Co-efficient. Motion of particles through fluids.Its mechanics, Terminal velocity.

Module III:
Friction in flow through beds of solids, Fluidization, Mechanism of fluidization, pressure drop in fluidization, Applications of fluidization.
Transportation of fluids, Reciprocating, rotary, and centrifugal pump, fans, blowers & compressors. Characteristics curves & calculation of power & efficiency of pumps.Concept of slip.

Text Books:
1. Unit Operations of Chemical Engineering, 7th ed. by W L McCabe, J C Smith, and P Harriott, McGraw-Hill.
2. Fluid Mechanics for Chemical Engineers, 3rd ed. by Noel de Nevers, McGraw-Hill.

Reference Books:
1. A Textbook of Fluid Mechanics and Hydraulic Machines, 9th ed. by R K Bansal.
2. Fluid Mechanics: Including Hydraulic Machines by A K Jain.
3. Introduction to Fluid Mechanics and Fluid Machines, 3rd ed. by S K Som, G Biswas, and S Chakraborty, McGraw-Hill, 2011.

FLUID FLOW LAB

1. Manometers – To find the pressure drop for flow through pipes.
2. Fluidized bed – To determine minimum fluidization velocity and pressure drop.
3. Centrifugal Pump – To draw the characteristics curves and find out the efficiency.
4. Reciprocating Pump – To draw the characteristics curves and find out the efficiency.
5. Venturi and Orifice Meter – To find out the flow rate of fluid flowing inside a pipe.
6. Reynold's Apparatus – To verify the flow whether it is laminar or turbulent.
7. Bernoulli's Apparatus – To verify the Bernoulli's equation.
8. Pitot tube – To find out the point velocity of fluid.
9. V-Notch – To measure the flow rate of a fluid by using V – Notch.
10. Packed Bed – To find out the pressure drop when a fluid is flowing through a packed bed.

CHEMICAL TECHNOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module I:
Heavy Chemicals: Caustic Soda & Chlorine, HCL, Soda Ash, Sulphuric acid.

Module II:
Extraction Refining of Oil, hydrogenation of Oil.
Soap & synthetic detergents.
Pulp & paper Industry.
Technology of Pigment & dyes, Natural dyes.

Module III:
Manufacture of Sugar, Starch & its derivatives, Industrial & absolute alcohol.

Module IV:
Polymers: Polyethylene, Polypropylene, PVC, Phenol formaldehyde, Urea formaldehyde, Polystyrene, Poly vinylacetate, Polylactic acid, and Nylons.

Text Books:

1. Dryden's Outlines of Chemical Technology for the 21st Century, 3rd ed. by C E Dryden, Edited & revised by M Gopal Rao and M Sittig.
2. Shreve's Chemical Process Industries, 5th ed. by G T Austin, McGraw-Hill.

CHEMICAL TECHNOLOGY LAB

1. Manufacture of soap from vegetable oil.
2. Determination of dissolved oxygen of the given water sample.
3. Determination of saponification value of the given oil sample.
4. Determination of acid value of the given oil sample.
5. Determination of concentration of sugar solution by Refractometer.
6. Estimation of nitrogen in nitrogenous fertilizer.
7. Determination of total, temporary, & permanent hardness of given water sample.
8. Determination of CaO in Cement.
9. Determination of alkalinity in water sample.
10. Manufacture of phenol formaldehyde

MECHANICAL OPERATIONS

Theory L/T (Hours per week): 3/0, Credit: 3

Objectives: This course acquaints the students of the mechanical method of sizing, separating & transportation of particles.

Module I:
Properties and storage of solids: Characteristics of solid particles and solids in bulk.
Size Reduction: Objectives, Methods, and Principles of size reduction, Size reduction equipments: Coarse, Intermediate, and Fine Crushers and Ultra-fine grinders, Open & closed circuit grinding.

Module II:
Solid-solid separation: Screening, Electrical separation, Classification, Gravity concentration, and Floatation and their latest equipments.
Solid-liquid separation: Sedimentation and equipments (Thickeners and clarifiers), Filtration: Theory and equipments.

Module III:
Gas-solid separation: Principle and equipments.
Transportation of solids: Conveyors and elevators.

Module IV:
Mixing: Theory of solid and liquid mixing and their equipments.
Size enlargement, Crystallization, Feeding, Weighing, and Coagulation.

Text Book:
1. Mechanical Operations, 1st ed. by A K Swain, H Patra, and G K Roy, McGraw-Hill.

Reference Books:
1. Unit Operations of Chemical Engineering, 7th ed. by W L McCabe, J C Smith, and P Harriott, McGraw-Hill.
2. Mechanical Operations for Chemical Engineers, 3rd ed. by C M Narayanan and B C Bhattacharya, Khanna Publishers.
3. Perry's Chemical Engineers' Handbook, 8th ed. by D W Green and R H Perry, McGraw-Hill.
4. Introduction to Chemical Engineering by W L Badger and J T Banchero, McGraw-Hill.
5. Unit Operations, by G G Brown, et. al., CBS Publishers.
6. Handbook of Mineral Dressing: Ores and Industrial Minerals by A F Taggart, John Wiley.

MECHANICAL OPERATION LAB

1. To find out the average size of particles in a sample (Volume-surface mean dia).
2. To determine the critical speed and time of grinding in a ball mill for producing a product with 80% passing a given screen.
3. To separate a mixture of coal into two fractions using sink and float method and/or floatation method.
4. Determination of the effectiveness of a vibrating screen.
5. To verify the Rittinger's and Kick's law using crushing rolls and to find out the Work Index of the coal.

6. To study the characteristics of batch sedimentation using coal sample.
7. To determine the specific cake resistance and filter medium resistance of a slurry in Plate and frame filter press.
8. To separate a mixture of sand and iron powder by means of tabling.
9. To find out the reduction ratio in Jaw Crusher and Hammer Mill.
10. To find out the separation characteristics of Cyclone separator

MASS TRANSFER - I

Theory L/T (Hours per week): 3/0, Credit: 3

Module I:
Introduction to Mass transfer operations, molecular diffusion in fluids, binary solutions, Fick's law, equation of continuity, steady state equimolal counter current diffusion, Stefan-Maxwell equation, diffusivity of gases and liquids, application of molecular diffusion, mass transfer coefficients, in laminar and turbulent flow, Interphase mass transfer, Film theory, Penetration theory, surface-renewal theories, analogy between mass, heat and momentum transfer.

Module II:
Absorption : Solubility of gases in liquids, two components system, multi component system, ideal and non - ideal solutions, choice of solvent for absorption, single component absorption material balance, counter current multistage operations, dilute gas mixtures, non - isothermal operation, tray efficiency, continuous contact equipment, HETP, HTU, NTU concepts for single component absorption.

Module III:
Principle of VLE for binary systems, phase diagrams, relative volatility, ideal solutions, azeotropes, enthalpy concentration diagrams, flash vaporization, partial condensation, differential distillation steam distillation, azeotropic and extractive distillation. Continuous distillation: Mc Cabe - Thiele method, Ponchon - Savarit method, Tray efficiencies, introduction to multi component distillation.

Module IV:
Humidification operations: Definition of fundamental terms, Psychometric charts, theory of adiabatic saturation and wet bulb temperature, Lewis relation, Gas liquid contact, Dehumidification, Adiabatic Humidification. Equipments: Natural Circulation, Natural draft, Mechanical draft, Spray tower, Spray chamber, Spray pond. Humidity Measurement: Direct chemical method, Hygrometer method, Sling psychrometer, Dew point method, Mirror method.

Reference Books:
1. Mass Transfer Operations by R E Treybal, McGraw Hill.
2. Unit Operations of Chemical Engineering, 7th ed. by W L McCabe, J C Smith, and P Harriott, McGraw-Hill.
3. Design of Equilibrium Stage Processes by B D Smith, McGraw-Hill.
4. Principles of Mass Transfer and Separation Processes by B K Dutta, PHI.
5. Mass Transfer Operations by A Suryanarayana, New Age International.

MASS TRANSFER - I LAB

1. To determine the diffusivity coefficient for carbon tetrachloride - air system.
2. To determine the vapour – liquid equilibrium curve for carbon tetrachloride - air system.
3. To verify Rayleigh's equation through simple distillation for binary mixture of water and ethanol.
4. To determine the vaporization and thermal efficiencies in steam distillation of the given organic liquid i.e. nitrobenzene or aniline.
5. Performance of lab scale bubble cap distillation column at different reflux ratios.
6. To study the height equivalent to a theoretical plate (HETP) of packed column at total reflux for a binary system of ethanol and water using Fenske's equation.

CHEMICAL PROCESS CALCULATION

Theory L/T (Hours per week): 3/1, Credit: 4

Module I:
Units & dimensions, Ideal gas laws, equation of state, Vapor pressure, Clausius-Clapeyron equation, Ideal and non-ideal solutions, humidity-relative saturation & percentage saturation, concept of wet & dry bulbs thermometer, use of Humidity chart.

Module II:
The chemical equation & stoichiomentry, concept of limiting & excess reactants, conversion, degree of conversion, yield etc.
Material balances & unit operations: drying, crystallization dissolution, combustion, etc.
Solving material balance (steady and unsteady state processes) without and with chemical reactions, recycle, bypass, & purge calculations.

Module III:
Energy balance concepts: Heat capacity, Calculation of enthalpy changes without change of phase, Energy balance with chemical reaction, Standard heat of reaction at constant, pressure & constant volume, effect of T and P on heat of reaction, Adiabatic reaction of temperature, heat of solution & mixing.

Text Books:

1. Stoichiometry and Process Calculations by B Lakshmikutty and K V Narayanan, PHI.
2. Stoichiometry, 5th ed. by B I Bhatt and S B Thakore, McGraw-Hill.

References Books:

1. Elementary Principles of Chemical Processes, 3rd ed. by R M Felder and R W Rousseau, John Wiley.
2. Chemical Process Principles: Material and Energy Balances (Part - 1), 2nd ed. by O A Hougen, K M Watson, and R A Ragatz, CBS.
3. Principles of Chemical Engineering Processes by N Ghasem and R Henda, CRC.
4. Basic Principles and Calculations in Chemical Engineering, 8th ed. by D M Himmelblau and J B Riggs, PHI

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	9

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

ADVANCED FLUID DYNAMICS

(Major)

Module I:

Properties of fluids and multiphase flow: Fluids and fluid properties, Kinematics: Motion, streamlines, pathlines, and streaklines. Newtonian, non-Newtonian, and non-viscous fluids. Continuity equation in cartesian, cylindrical, and spherical coordinates. Derivation of general momentum equation for Newtonian fluids in cartesian coordinates.

Module II:

Eulers' equation, principles of rotational and irrotational flow, velocity potential, Bernoulli's equation, Laplace equations, stream function, vorticity, Cauchy-Rieman equation. Analytical solutions for simple two dimensional incompressible, irrotational fluid flows: flow along two inclined plates, point source or sink in an infinite fluid. Stokes law of viscosity, Navier-stokes equation, creeping flow around a solid sphere, expression for total drag.

Module III:

Turbulent flow: Transition to turbulence, Prandtl's mixing length, Turbulence models. Boundary layer on immersed bodies, two dimensional boundary layer equation, laminar

boundary layer on flat plate (Blasius' exact solution), Von-Karmann's integral momentum equation, boundary layer separation flow and pressure drag, Flow of compressible fluids, thermodynamic considerations, continuity and momentum equation for one dimensional compressible flow, one dimensional normal shock, flow through fluidized beds. Navier-Stokes equation and various approaches of simulation (stream velocity, primitive variable).

Reference Books:

1. Introduction to Fluid Mechanics,8th ed. by RWFox, ATMcDonald, and PJPritchard, John Willey& Sons.
2. Fluid Dynamics and Heat Transfer by JGKnudsen and DLKatz, McGraw-Hill.
3. Transport Phenomena, 2nd ed. by RBBird, WEStewart, and ENLightfoot, John Wiley and Son.

SOLAR ENERGY ENGINEERING

(Minor)

Module I:

Sources of radiation, solar constant, solar charts, Measurement of diffuse, global and direct solar radiation: pyrheliometer, pyranometer, pyregeometer, net pyradiometer-sunshine recorder.

Module II:

Solar non-concentrating collectors: Design considerations. Classification, Air and liquid heating collectors. Derivation of efficiency and testing of flat plate collectors. Analysis of concentric tube collector. Solar green house: Design and classification. Concentrator mounting: Focusing solar concentrators, Heliostats.

Module III:

Solar powered absorption A/C system, water pump, chimney, drier, dehumidifier, still, cooker. Photo-voltaic cell: Characteristics, cell arrays. Power electric circuits for output of solar panels, choppers, inverters, batteries, charge regulators, construction concepts. Energy Storage: Sensible, latent heat, and thermo-chemical storage, pebble bed, etc. Solar ponds.

Text Books:

1. Principles of Solar Engineering 2nd ed. by DY Goswami, F Kreith, and JFKreider, Taylor & Francis.
2. Fundamentals for Solar Energy Conversion by EE Anderson, Addison-Wesley Publ. Co.

Reference Books:

1. Solar Engineering of Thermal Processes by J A Duffie and W A Beckman, John Wiley.
2. Fundamentals of Renewable Energy Sources by GNTiwari and MKGhosal,Narosa Publishing House.
3. Energy Studies 2nd ed. by WShepherd and DWShepherd, Imperial College Press.

CIVIL ENGINEERING

MECHANICS OF SOLIDS

Theory L/T (Hours per week): 3/1, Credit: 4

Module-I (12 classes)

Simple Stress and Strain -Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Compound Stress and strain- Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders.Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

Module-II (10 classes)

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions,Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for determinate beams.

Module-III (10 classes)

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

Module-IV (8 classes)

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

TEXT BOOKS

1. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
2. Strength of Materials by G. H. Ryder, Macmillan Press
3. Strength of Materials by R.Subramaniam, Oxford University Press
4. Strength of Material by S. S. Ratan, McGraw Hill

REFERENCE BOOKS

1. Mechanics of Materials by Beer and Johnston, McGraw Hill
2. Mechanics of Materials by R.C.Hibbeler, Pearson Education
1. 3.Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

FLUID MECHANICS & HYDRAULICS MACHINES

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I (12 classes)

Introduction - Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid statics - Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.Hydrostatic pressure on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Module-II (10 classes)

Fluid kinematics - Introduction, description of fluid flow, classification of fluid flow.Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity,Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net

Module-III (8 classes)

Fluid dynamics - Introduction, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube.Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

Module-IV (10 classes)

Hydraulic turbine: Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine.Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.Reaction Turbines: Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation Centrifugal Pump: constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation. Positive displacement pumps: Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

TEXT BOOKS

1. Fluid Mechanics and Hydraulic Machines, P. N. Modi&S.M Seth, STANDARD BOOK HOUSE
2. A Text Book of Fluid Mechanics and Hydraulic Machines, R.K.Bansal, Laxmi Publications
3. Fluid Mechanics and Machinery, CSP Ojha and P.N. Chandramouli, Oxford University Press
4. Engineering Fluid Mechanics & Hydraulic Machines**,** K. C. Patra, Narosa Publishing House, Standard Book House

REFERENCE BOOKS

1. Fluid Mechanics , J. F. Douglas, J. M. Gasiorek, J. A. Swaffield, , Pearson Education,
2. Fluid Mechanics, F. M. White, McGraw-Hill
3. Fluid Mechanics Foundations and Application of Mechanics, C.S.Jog, Cambridge University Press
4. Fluid Mechanics and Fluid Machines, Som&Biswas, McGraw Hill
5. Problems in Fluid Mechanics**,** Subramanyam, McGraw Hill

FLUID MECHANICS & HYDRAULICS MACHINES LAB

1. Determination of Metacentric Height
2. Proof of Bernoulli's Theory
3. Determination of Coefficient of Discharge for V-notch
4. Determination of Coefficient of Discharge for Orifice meter
5. Determination of Coefficient of Discharge for Venturimeter
6. Determination of Reynold'sNumber
7. Friction Flow through Pipes
8. Determination of losses due to bends, fittings and elbows in pipes
9. Impact of Jets
10. Efficiency of Francis Turbine
11. Characteristics of Pelton wheel turbine
12. Discharge through Centrifugal Pump.

SURVEYING

Theory L/T (Hours per week): 3/0, Credit: 3

Module I (10 classes)

Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination.

Compass surveying: Use of prismatic compass, temporary adjustment, bearing of a line, local attractions, correction of bearing

Module II (8 classes)

Levelling: Use of dumpy level and levelling staff.Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal levelling, levelling difficulties and common errors, Automatic and Electronic or Digital levels

Module III (10 classes)

Contouring: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, contour gradient

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing

Module IV (8 classes)

Modern Surveying Instruments – Electromagnetic Spectrum, Radar, Electronic Distance Measurement, EDM Equipment, Corrections to measurement, Digital Theodolite, Total Stations, Introduction to Remote Sensing and GIS

Text Books

1. Surveying &Levelling. Vol-I by T.P.Kanethar&S.V.Kulkarni, Pune VidyarthiGrihaPrakashan
2. Surveying and Leveling by R. Subramanian, Oxford University Press
3. Surveying- Vol.I, by B.C. Punmia, Laxmi Publications

Reference Books

1. Surveying Vol-1 by R Agor, Khanna Publishers
2. A Textbook of Surveying, C. Venkatramaiah, Universities Press
3. Surveying AndLevelling, N.N. Basak, McGraw-Hill Education

SURVEY – I LAB

1. Testing of chain and measurement of correct length of the line and chain traversing.
2. Traversing by Compass
3. Horizontal and vertical angle by theodolite
4. Traversing by theodolite
5. Use of dumpy level and automatic level for fly levelling.
6. Contouring
7. Measurement of distance, horizontal and vertical angle by Total Station
8. Contouring by Total Station

GEOTECHNICAL ENGINEERING

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I (10classes)

Origin of Soil and Grain Size: Rock Cycle and the origin of soil, soil particle size, clay minerals, mechanical analysis of soil, grain size distribution curve, particle shape, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density, Consistency of soil: Atterberg limits - liquid limit, plastic limit, shrinkage limit. Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: IS, USCS, HRB and ASTM.

Module-II (10 classes)

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil Compaction: mechanism and principles, Standard and Modified Proctor Test, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

Module-III (10 classes)

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation.Stresses in Soil: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Module-IV (10 classes)

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test. Other methods of determining the un-drained shear strength of soil, sensitivity and thixotropy of clay.Stability of Slopes: Terminology, stability of finite and infinite slopes, Swedish slip circle method and friction circle method of analysis of slopes, Taylor stability Number and stability curves, Bishops Method.

TEXT BOOKS

1. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning
2. Soil Mechanics and Foundation Engineering by B. C Punmia et al., Laxmi Publications Pvt Ltd
3. Soil Mechanics and Foundation Engineering, by K.R. Arora, Stanard Publishers
4. Soil Mechanics and Foundation Engineering by B.N.D. NarasingaRao, Wiley India Pvt. Ltd

REFERENCE BOOKS

1. Basic and applied soil mechanics, New Age International Publishers
2. Geotechnical Engineering by T.N. Ramamurthy & T.G. Sitharam,S. Chand & Co.
3. Geotechnical Engineering, S.K.Gulati and M. Datta, McGrow Hill

GEOTECHNICAL ENGINEERING LAB

1. Determination of specific gravity of soil grains
2. Determination of grain size distribution of soil
   (a)Sieve test (b) Hydrometer/ pipette test
3. Determination of Atterberg limits of soil
   Liquid limit (b) plastic limit (c) shrinkage limit
4. Measurement of soil compaction in the field
   Core cutter method (b) Sand replacement method
5. Determination of Density – Water content relationship of soil.
   Proctor compaction test (ii) Modified Proctor compaction test (c) Use of Proctor penetration needle
6. Determination of relative density of granular soil
7. Determination of shear strength parameters of soil
   (a)Shear Box test (b) Tri-axial compression test (c) Unconfined compression test (d) Vane shear test
8. Determination of consolidation characteristics of soil using fixed ring Oedometer
9. Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil specimens
10. Determination of coefficient of permeability of soil
    (a)Constant head permeameter (b) Falling head permeameter

CONSTRUCTION TECHNOLOGY

Theory L/T (Hours per week): 3/0, Credit: 3

Module I(10 classes)

Introduction of various Civil Engineeringstructures, Functions of various components ofbuilding and other structures

Fundamentals of Construction Technology: Introduction, Construction activities, construction process, construction workers, construction estimating, construction estimate, construction schedule, productivity and mechanized construction, Quality and safety

Preparatory Work and Implementation: Site layout, Infrastructure development, construction methods, construction materials, deployment of construction equipment, prefabrication in construction, falsework and temporary work,

Module II (10 classes)

Earthwork: Introduction, Classification of soil, project site development, setting out, mechanized excavation, ground water control. Piling: classification of piles, pile driving methods, load test and quality control

Concrete and Concreting: Introduction, Important properties of concrete, Use of admixtures, formwork, shotcrete, lightweight and heavyweight concrete, ready-mix concrete, high performance concrete, self-compacting concrete, extreme weather concreting, prestressed concrete, under water concreting, curing of concrete, non-destructive testing of hardened concrete

Roof and roofing: Introduction, cast-in-situ reinforced concrete roofs, precast reinforced concrete roofs, roofs covered with sheets, water proofing over roofs

Finishing Work: Introduction, plastering, pointing, facing, glazing, flooring, painting,Construction joints-need and materialsused, Plumbing and electrification-various typesof fittings and laying procedure,

Module III (10 classes)

Mechanized Construction: Introduction, general consideration, plants for earthwork-tractor, bulldozer, ripper, scraper, face shovel, backhoe, dragline, clamshell etc., roller, plants for transportation, movement and handling- derrick, crane, hoist, concrete mixers and pumps, scaffoldingBuilding items: Plastering & pointing- its purpose,various types, construction procedures,advantages and disadvantages, suitabilityofeach, Damp proof course (DPC), Anti-termite measures and treatment, Construction joints-need and materialsused, Plumbing and electrification- various typesof fittings and laying procedure,

Module IV (6 classes)

Building Maintenance and Safety Measures: Purpose, need, importance, methods, Causes and types of defects in buildings, Preparation of report on maintenance work, Remedial measures and executionprocedure of any one type of buildingmaintenance work, Importance of various Laws / Norms / Regulations / Acts for safety, Precautions and precautionary Measures, Post-accident procedures.

Text Books

1. Construction Technology, SubirSarkar and SubhajitSaraswati, Oxford University Press
2. Construction Planning and Management, U.K. Srivastava, Galgotia Publications Pvt Ltd
3. Construction Engineering and Man agent, S. Seetharaman, Umesh Publications

Reference Books

4. Concrete Technology, Santha Kumar, Oxford University Press
5. Construction Technology Analysis and Choice, Tony Bryan, Wiley
6. Building Construction, B.C.Punmia, Laxmi Publication
7. Building Construction, Sushil Kumar, Standard Publisher
8. Building Construction, Rangwala, Charotar Pub House

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

4. To develop an understanding of the behavior of individuals and groups inside organizations
5. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
6. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.	10

Personality and values: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.
Perception: Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).
Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	**9**
04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

BUILDING DRAWING LAB (0-0-2)

1. The drawing is to be drawn using AutoCAD.
2. Plan, elevation, side view of residential/office building
3. Drawing of 2 bed room/3 bed room houses (single and two storeyed), ground and first floor plans, elevation and section for load bearing and framed structures
4. Detailing of doors/windows
5. Drawing of several types of footing, bricks work, floor, staircases, masonry, arches and lintels
6. Types of steel roof trusses
7. Project on establishments like Bank building/ Post office/ Hostel/ Library/ Hospital/ Auditorium etc

CONCRETE TECHNOLOGY(Honours Subject)

Module I (10 classes)

Cement:Portland cement- chemical composition, Hydration, Setting of cement, Structure of hydrate cement, Test on physical properties, Different grades of cement.
Admixtures: Types of admixtures - mineral and chemical admixtures -properties - dosages - effects - usage.
Aggregates: Classification of aggregate, Particle shape & texture, Bond, strength & other mechanical properties of aggregate, Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate, Bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Thermal properties, Sieve analysis, Fineness modulus , Grading curves, Grading of fine & coarse Aggregates, Gap graded aggregate, Maximum aggregate size.

Module II(8 classes)

Fresh concrete: Workability - Factors affecting workability, Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability , Segregation & bleeding, Mixing and vibration of concrete, Steps in manufacture of concrete , Quality of mixing water.
Hardened concrete: Water Cement ratio , Abram's Law, Nature of strength of concrete, Maturity concept , Strength in tension & compression, Factors affecting strength, Relation between compression & tensile strength, Curing.

Module III(10classes)

Testing of hardened concrete:Compression tests, tension tests, factors affecting strength , flexure tests , splitting tests , pull-out rest, non-destructive testing methods - codal provisions for NDT.
Elasticity, creep & shrinkage : modulus of elasticity, dynamic modulus of elasticity, posisson's ratio, creep of concrete, factors influencing creep, relation between creep & time , nature of creep, effects of creep , shrinkage , types of shrinkage.

Module IV (8 classes)

Mix design :Factors in the choice of mix proportions , Durability of concrete, Quality Control of concrete , Statistical methods , Acceptance criteria, Proportioning of concrete mixes by various methods , BIS method of mix design.

Special concretes: Light weight aggregates - Light weight aggregate concrete - Cellular concrete - **No-fipes concrete** - High density concrete -Fibre reinforced concrete - Polymer concrete - Types of Polymer concrete - High performance concrete - Self compacting concrete.

Text Books

1. Concrete Technology - Gambhir, M.L., , McGraw Hill
2. Properties of Concrete by A.M.Neville
3. Concrete Technology by M.S.Shetty. - S.Chand& Co.
4. Concrete Technology by Santakumar A.R, Oxford University Press

MECHANICS OF SOLIDS (Minor subject)

Theory L/T (Hours per week): 3/1, Credit: 4

Module-I (12 classes)

Simple Stress and Strain -Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Compound Stress and strain- Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders.Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

Module-II (10 classes)

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions,Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for determinate beams.

Module-III (10 classes)

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

Module-IV (8 classes)

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

TEXT BOOKS

5. Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press
6. Strength of Materials by G. H. Ryder, Macmillan Press
7. Strength of Materials by R.Subramaniam, Oxford University Press
8. Strength of Material by S. S. Ratan, McGraw Hill

REFERENCE BOOKS

3. Mechanics of Materials by Beer and Johnston, McGraw Hill
4. Mechanics of Materials by R.C.Hibbeler, Pearson Education
2. 3.Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

COMPUTER SCIENCE AND ENGINEERING/ INFORMATION TECHNOLOGY

SWITCHING CIRCUITS AND LOGIC DESIGN

Theory L/T (Hours per week): 3/0, Credit: 3

Introduction: Logic design, transistors as switches, CMOS gates, sequential circuits,some examples.

Digital Systems: Representation of numbers, binary codes, Gray code, error-detecting and error-correcting codes, registers, binary logic, basic logic gates.

Boolean Algebra: Boolean operations, Boolean functions, algebraic manipulations, minterms and maxterms, sum-of-products and product-of-sum representations, two-input logic gates, functional completeness.

Minimization of Boolean Functions: Karnaugh map, don't-care conditions, prime implicants, Quine–McCluskey technique, Logic gates, NAND/NOR gates, Universal gates.

Combinational Circuits: Adder, subtractor, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, MUX Realization of switching functions, Parity bit generator, Code-converters, Hazards and hazard free realizations

Synchronous Sequential Circuits: Finite-state machines, latches and flip-flops (SR, D, JK, T), synthesis of clocked sequential circuits, Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder.

Registers and Counters: Registers and shift registers, sequential adders, binary and BCD ripple counters, synchronous counters

Algorithmic State Machines: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

Text Book:

1. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
2. Digital Electronics by G.K. Kharate, Oxford University Press

References:

1. Switching & Finite Automata theory – Z. Kohavi, TMH,2nd Edition.
2. An Engineering Approach To Digital Design – Fletcher, PHI.
3. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
4. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006

SWITCHING CIRCUITS AND LOGIC DESIGN LAB

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NANDGate.
2. Gate-level minimization: Two level and multi level implementation of Booleanfunctions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, comparators.
4. Design and Implementation of code converters, gray code to binary and BCD to seven segment display.
5. Design and Implementation of a function using MUX/ DEMUX.
6. Design of functions using encoder, decoder.
7. Flip-Flop: assemble, test and investigate operation of SR, D & J-Kflip-flops.
8. Shift Registers: Design and investigate the operation of all types of shift registers with parallelload.
9. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallelload.
10. Design of Binary Multiplier.
11. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 1 to 10.
12. C/C++ implementation of Experiments listed at Sl. No. 1 to 10.

OBJECT ORIENTED PROGRAMMING USING JAVA

Module1:-

Chapter 1-: An introduction to programming.
Different types of programming languages, Description of Compiler and Interpreter, Advantage of Object Oriented Programming, Object Oriented Programming, Features of Object Oriented Programming.
Chapter 2-: Introduction to Java.
What is Java?, Why Java?, History behind Java, Different versions of Java, Difference between C/C++ and Java, Features of Java, First Java Program, Prerequisites Before start writing a java program, Writing the program, Compiling the program, How Java program compiles?, Executing the program, How Java program executes?, What is JVM and its significance in executing a program?, Architecture of JVM.
Chapter 3-: Understanding First Program and a step forward, Understanding every term of the program, Java Tokens, Datatypes, Operators, What are Operators?, Different types of Operators, Typecasting, Control Structures and Arrays, Different types of control structures, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

Module 2: -

Chapter 1-: Introduction to Classes and Objects.
Classes, Methods, Objects, Description of data hiding and data encapsulation, Constructors, Use of static Keyword in Java, Use of this Keyword in Java, Array of Objects, Concept of Access Modifiers (Public, Private, Protected, Default).
Chapter 2-: Inheritance
Understanding Inheritance, Types of Inheritance and Java supported Inheritance, Significance of Inheritance, Constructor call in Inheritance, Use of super keyword in Java, Polymorphism, Understanding Polymorphism, Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching.
Chapter 3-: String Manipulations.
Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer, Concept of Wrapper Classes, Introduction to wrapper classes, Different predefined wrapper classes, Predefined Constructors for the wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing.
Chapter 4:- Data Abstraction
Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple Inheritance Using Interfaces, Packages, Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Introduction to error and exception, Types of exceptions and difference between the types, Runtime Stack Mechanism, Hierarchy of Exception classes, Default exception handling in Java, User defined/Customized Exception Handling, Understanding different keywords (try, catch, finally, throw, throws), User defined exception classes, Commonly used Exceptions and their details.
Chapter 5:- Multithreading
Introduction of Multithreading/Multitasking, Ways to define a Thread in Java, Thread naming and Priorities, Thread execution prevention methods. (yield(), join(), sleep()),

Concept of Synchronisation, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.

Module 3: -

Chapter 1:- IO Streams (java.io package)
Introduction, Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Introduction, Util Package interfaces, List, Set, Map etc, List interfaces and its classes, Setter interfaces and its classes.

Chapter 2:-Applet
Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Module 4: -

Chapter 1:- Swing (JFC)
Introduction Diff b/w awt and swing, Components Hierarchy, Panes, Individual Swings Components JLabel, JButton, JTextField, JTextArea.

Chapter 2:- JavaFX
Getting started with JavaFX, Graphics, User Interface Components, Effects, Animation, and Media, Application Logic, Interoperability, JavaFX Scene Builder 2, Getting Started with scene Builder.
Working with scene Builder.

Text Book:-

1. Programming in Java. Second Edition. OXFORD HIGHER EDUCATION. (SACHIN MALHOTRA/SAURAV CHOUDHARY)
2. CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication

Reference Book:-

1. JAVA Complete Reference (9th Edition) Herbalt Schelidt.

JAVA PROGRAMMING LAB

JAVA programs on:

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.
6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics

SYSTEM PROGRAMMING

Module I (12 Hrs)

Introduction: System Software, Application Software, components of a programming system: Assembler, Loader, Linker, Macros, Compiler, Program Development Cycle, Evolution of Operating Systems, Functions of Operating System, Machine Structure: General Machine Structure, Approach to a new machine, Memory Registers, Data, Instructions, Evolution of Machine Language: Long Way, No looping, Address Modification, Looping, Introduction to Assembly Language Program.

Module II (12 Hrs)

Assemblers: Design Procedure, Design of Assembler, Two-pass Assembler, Table Processing. Macros Language and Macro Processor: Macro Instructions, Features of a Macro Facility, Implementation. Loaders: Loader Schemes, Design of an Absolute Loader, Direct Linking loader, Bootstrap Loader. Dynamic Loading and Linking, Algorithm and Data structures for Linking Loader, Linkers and Linkage Editors.

Module III (10 Hrs)

Programming Languages: Importance of High Level Languages, Features, Data Types and Data Structures, Storage Allocation and Scope Name, Accessing Flexibility, Functional Modularity, Formal Systems: Uses of Formal Systems, Formal Specification, Formal Grammars, Introduction to Compilers, passes of compiler, Phases of a compiler, Interpreter.

Module IV (06 Hrs)

Software Tools for Program Development, Editor, Design and User Interface, Programming Environment and Integrated Development Environments, Debugger Functionalities, Debug Monitors, Debugger Facilities, Debugger Internal Mechanism Operating.

Text Book:

Systems Programming by John J Donovan (McGraw-Hill Education)

Reference Book:

(1) Operating System and System Programming – Dhamdhere (McGraw-Hill Education)
(2) System Programming,by Srimanta Pal, Oxford University Press
(3) System Software, S. Chattopadhyay (Prentice-Hall India)
(4) System Programming with C and UNIX. - Hoover (Pearson Education)
(5) System Software: An Introduction to systems programming by Leland Beck (Pearson)
(6) System Software: Nityashri (McGraw-Hill Education)

SYSTEM PROGRAMMING LABORATORY

1. Programs using 8085 Microprocessor
   a. addition
   b. subtraction
   c. multiplication
   d. division
2. Program on linker using stack concept.
3. Program on design of Macro using C/C++
4. Program on design of assembler using C/C++
5. Program on design of loader using C/C++
6. Program on design of a lexical analyzer using LEX.
7. Program on design of a parser using YACC

SOFTWARE ENGINEERING

Theory L/T (Hours per week): 3/0, Credit: 3

Software Process Models:

Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.

Software Requirements Engineering:

Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification(SRS), IEEE 830 guidelines, Decision tables and trees.

Structured Analysis & Design: (10Hrs)

Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.,

Coding and Software Testing Techniques:

Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Software Reliability and Software Maintenance:

Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:

Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS),

Text Book:

1. Fundamentals of Software Engineering, Rajib Mall , PHI, 2014.

Reference Books:

1. Software Engineering, A Practitioner's Approach, Roger S. Pressman ,TMG Hill.
2. Software Engineering, I. Sommerville, 9th Ed. , Pearson Education.

SOFTWARE ENGINEERING LABORATORY

Experiment1: Develop requirements specification for a given problem(The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems, see the questions section of Chap 6 of Software Engineering book of Rajib Mall)

Experiment 2: Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required)

Experiment 3: Develop structured design for the DFD model developed

Experiment 4: Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required)

Experiment 5: Develop Sequence Diagrams.

Experiment 6: Develop Class diagrams.

Experiment 7: Develop code for the developed class model using Java.

Experiment 8: Use testing tool such as Junit.

Experiment 9: Use a configuration management tool.

Experiment 10: Use any one project management tool such as Microsoft Project or Gantt Project, etc.

DISCRETE STRUCTURES

Theory L/T (Hours per week): 3/1, Credit: 4

Module-1.(15 Hours)

Sets and Propositions: Principle of Inclusion and Exclusion, Mathematical induction, Propositions, Logical Connectives, Conditionals and Biconditionals, Logical Equivalences, Predicate Calculus, Quantifiers, Theory of inference, Methods of proof. Relations and Functions: properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations, Partial ordering relations and lattices, Chains and antichains, Functions, Composition of Functions, Invertible Functions, Recursive Functions, Pigeonhole principle.

Module-2. (5 Hours)

Numeric Functions and Generating Functions: Discrete Numeric functions, Generating Functions, Recurrence Relations and Recursive Algorithms:Recurrence relations, Linear recurrence relations with constant coefficients, Solution of recurrence relations by the method of generating functions, Divide and conquer algorithms,

Module-3.(10 Hours)

Groups and Rings: groups and subgroups, Cosets and Lagrange's theorem, Codes and Group codes, Error detection and correction using Group codes, Isomorphism, Homomorphism and normal subgroups, Rings, Integral domains and Fields, Boolean Algebras: Lattices and algebraic systems, Principle of duality, Distributive and complemented lattices, Boolean functions and Boolean expressions, Simplification of logic expressions using Karnaugh Map, Design and Implementation of Digital Networks, Switching Circuits.

Module-4.(10 Hours)

Graphs and Trees: Basic terminology, Diagraphs and relations, representation of Graphs, operations on graphs, paths and circuits, graph traversals, shortest path in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, Traveling sales person's problem, Planar graphs, Graph Coloring, Trees, Rooted trees, Binary search trees, Spanning trees, Minimum spanning trees, Kruskal's Algorithm, Prim's Algorithm.

Text Book:

1. C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A computer Oriented Approach, McGraw Hill Education (India) Private Limited, 4th Edition, 2013.

Reference Books:

1. R.K.Bisht, and H.S.Dhami, Discrete Mathmatics, Oxford University Press, First Edition, 2015
2. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill, 5thed, 2003.
3. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications, to Computer Science, TataMc-Graw Hill, 2001.
4. Joe L. Mott, A. Kandel, and T. P. Baker, Discrete Mathematics for Computer Scientists & Mathematics, Prentice Hall of India, 2nd Edition, 2006.
5. N. Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India, 2006.
6. S. Lipschutz, Discrete Mathematics, Tata McGraw Hill, 2005

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	9

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS SUBJECT

ARTIFICIAL INTELLIGENCE

Module 1 (12Hrs)

What is Artificial Intelligence? AI Technique, Level of the Model,Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis,**Knowledge Representation:** Representations and Mappings, Approaches to Knowledge Representation, **Using Predicate Logic**: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.**Using Rules**: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.**Symbolic Reasoning Under Uncertainty**: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, Breadth-first Search.**Weak and Strong Slot-and-Filler Structures**: Semantic Nets, Frames, Conceptual DependencyScripts, CYC.

Module 2(10Hrs)

Game Playing: The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening.**Planning**: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical PlanningOther Planning Techniques.**Understanding**: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.**Natural Language Processing**: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

Module 3 (8Hrs)

Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. **Expert Systems**: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Text Book:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009

References:

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

MINOR SUBJECT

SOFTWARE ENGINEERING

Theory L/T (Hours per week): 3/0, Credit: 3

Software Process Models:
Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.

Software Requirements Engineering:
Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification(SRS), IEEE 830 guidelines, Decision tables and trees.

Structured Analysis & Design: (10Hrs)
Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.,

Coding and Software Testing Techniques:
Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Software Reliability and Software Maintenance:
Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:
Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS),

Text Book:

2. Fundamentals of Software Engineering, Rajib Mall , PHI, 2014.

Reference Books:

3. Software Engineering, A Practitioner's Approach, Roger S. Pressman ,TMG Hill.
4. Software Engineering, I. Sommerville, 9th Ed. , Pearson Education.

ELECTRICAL ENGINEERING/

ELECTRONICS AND ELECTRICAL ENGINEERING

NETWORK THEORY

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE- I **[11Hrs]**

University Portion (80%)Network Theorems: Superposition theorem, Thevenin's theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem.

Coupled Circuits: Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling.**Resonance:** Band Width and Q-factor for series and parallel resonant circuits.

College/Institute Portion (20%): Electrical equivalent of magnetically Coupled Circuit, Tuned Couple Circuit: Single tuned and double tuned or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- II **[9Hrs]**

University Portion (80%)

Laplace Transform & its Application: Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).

Two Port Network Functions& Responses: **z**, **y**, ABCD and **h**-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks.

Network Functions: Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behavior from Pole-Zero plots.

College/Institute Portion (20%):

Necessary conditions for transfer function, natural response of a network, Routh Hurwitz criterion of stability of network function **o**r related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- III **[5Hrs]**

University Portion (80%)

Fourier Series& its Application: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions.

Passive Filter: Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

College/Institute Portion (20%):

Active filter-Butterworth, Chebyshev filter or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- IV **[5Hrs]**

University Portion (80%)

Network Synthesis: Realizability concept, Hurwitz property, positive realness, properties of positive real functions, Synthesis of R-L, R-C and L-C driving point functions in Foster and Cauer forms.

College/Institute Portion (20%):

Network Topology: Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis, Dual of a network or related advanced topics as decided by the concerned faculty teaching the subject.

Text Book:

1. Fundamentals of Electric Circuits – Alexander & Sadiku – Tata McGraw Hil,5th Editionl.
2. Circuits & Networks: Analysis, Design and Synthesis- Sukhija & Nagsarkar- Oxford

Reference Book(s):

1. Network Analysis – M E Van Valkenburg – Pearson Education, 3rd Edition.
2. Network Synthesis – M E Van Valkenburg – Pearson Education.
3. Network Analysis and Synthesis – Franklin F. Kuo – Wiley Student Edition.
4. Linear Circuits Analysis and Synthesis – A Ramakalyan – Oxford University Press.
5. Problems & Solutions in Electric Circuit Analysis – Sivananda & Deepa – Jaico Book.
6. Theory and problem of electrical circuits, Schaum's Outline Series, TMH – Joseph A. Edminister, MahmoodMaqvi.
7. Electric Circuits – David A.Bell – Oxford, 7th Edition, 2015.

NETWORK THEORY LAB

Select any 8 experiments from the list of 10 experiments

1. Verification of Network Theorems using AC circuits. (Superposition, Thevenin, Norton, Maximum Power Transfer).
2. Study of DC and AC Transients for R-L, R-C & R-L-C circuits using storage oscilloscope.
3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
4. Determination of circuit parameters: Hybrid and Transmission parameters.
5. Frequency response of Low pass and Hih Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series circuit using oscilloscope.
9. Study of resonance in R-L-C parallel circuit using oscilloscope.
10. Spectral analysis of a non-sinusoidal waveform.

ANALOG ELECTRONICS CIRCUIT

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE – I **(12 Hours)**

MOS Field-Effect Transistor: Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. (4 Hours)

Biasing of BJTs: Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples.(4 Hours)

Biasing of FETs and MOSFETs: Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

MODULE – II **(12 Hours)**

Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of R_S and R_L on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits.

(6 Hours)

Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of R_{SIG} and R_L on CS Amplifier; Source Follower and Cascaded System.**(6 Hours)**

MODULE – III **(5 hours)**

High Frequency Response of FETs and BJTs: High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (**5 Hours)**

MODULE – IV **(9 hours)**

Feedback amplifier and Oscillators: Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. **(4 Hours)**

Operational Amplifier: Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. **(5Hours)**

Additional Module (Terminal Examination-Internal) **(6 hours)**

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the

theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and μA 741, Signal Generators using OPAMP: Square, triangle and ramp Generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

Text Books

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9th/10th Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2nd Edition,2008.

Reference Books

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5th Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2nd Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5thedition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009

ANALOG ELECTRONICS CIRCUIT LAB

List of Experiments

(At least 10 out of 12 experiments should be done)

1. Design and simulate BJT bias circuit and compare the results.
2. Design and simulate JEET/MOSFET bias circuit and compare the results.
3. Design and simulate BJT common-emitter circuit and compare D.C and A.C performance:
4. Design and simulate JFET/MOSFET common-emitter circuit and compare D.C and A.C performance:

5. Determining the frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response and compare with simulated results.
6. Differential amplifiers circuits: D.C bias and A.C operation without and with current source.
7. Study of Darlington connection and current mirror circuits.
8. OP-Amp Frequency Response and Compensation.
9. Application of Op-Amp as differentiator, integrator, square wave generator.
10. Obtain the band width of FET/ BJT using Square wave testing of an amplifier.
11. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
12. Class A and Class B Power Amplifier.

ELECTRICAL MACHINES- I

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE- I

University Portion (80%):

Single phase transformers: Phasor Diagrams at No -Load and Load Conditions of an Ideal transformer and practical transformer, Equivalent Circuit, Determination of Parameters from Tests (Polarity Test, Open Circuit Test and Short Circuit Test, Back to Back test), Per Unit Calculation and its importance, Voltage Regulation, Losses, Efficiency and all day efficiency. Parallel operation of transformers and load sharing.

Auto Transformer: Basic constructional features; VA conducted magnetically and electrically. Comparative study with two winding transformer.Conversion of a two winding transformer into a single winding transformer.

College/Institute Portion (20%):

Qualitative explanation for origin of harmonic current and voltage and its suppression. Inrush of switching currents, magnetizing current wave form or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- II

University Portion (80%):

Three phase transformers: Constructional features, As a single unit and as a bank of three single phase transformers. Three-Phase Transformer connections, The per unit system for Three Phase Transformer, Transformer Ratings and Related problems, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating. T-Connection (Scott Connection) of Two Single-Phase Transformers.

Transformer Three phase Connections: Various Phase Displacements (0^o, 180^o, $+30^o$ and -30^o), Connection Diagrams and Phasor Diagrams of various Vector Groups (Yy_0, Dd_0, Dz_0, Yy_6, Dd_6, Dz_6, Yd_1, Dy_1, Yz_1, Yd_{11}, Dy_{11}, and Yz_{11})

College/Institute Portion (20%):

3-winding transformer or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- III

University Portion (80%):

Three phase induction machines:

Constructional features and types; 3-phase distributed winding production of rotating magnetic field, Principle of Operation, The Effect of Coil Pitch and distribution factor on A.C. Machines, winding factor, Concept of Slip, Slip Speed; Phasor diagram and Development of equivalent circuit and derivation of torque equation; Typical torque-slip characteristic and influence of different parameters on it, No-Load and Blocked Rotor tests, Determination of Parameters, power flow diagram, Losses and Efficiency, Methods of starting and speed control. Cogging, Crawling.

College/Institute Portion (20%):

Brief Idea on Induction Generators,Different types of brakingor related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- IV

University Portion (80%):

Single phase induction machines: Double field revolving theory, Methods of starting using auxiliary winding, development of equivalent circuit. No-Load and Blocked Rotor tests, Determination of Parameters Speed Control of Single Phase Induction Motors.

College/Institute Portion (20%):

Selection of capacitor value during starting and running or related advanced topics as decided by the concerned faculty teaching the subject.

Text Book:

1. Theory and Performance of AC Machines – M G Say
2. Electric Machinery – Fitzgerald, Charles Kingsley Jr., S. D. Umans – Tata Mc Graw Hill.

Reference Book(s):

1. Electrical Machinery – P S Bimbhra – Khanna Publishers
2. The Performance and Design of DC Machines – A E Clayton.
3. Electric Machines – D P Kothari and I J Nagrath – Tata McGraw Hill, Fourth Edition.
4. Electric Machines – Charles Hubert – Pearson Education.
5. Electrical Machines – P K Mukherjee and S Chakravorti – Dhanpat Rai Publications.
6. Electric Machinery and Transformers – Guru & Hiziroglu – Oxford University Press.

ELECTRICAL MACHINES LAB-I

Select any 8 experiments from the list of 10 experiments

1. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
2. Parallel operation of two single phase transformers.
3. Back-to Back test on two single phase transformers.
4. Study of open delta and Scott connection of two single phase transformers.
5. Speed control of a three phase induction motor using variable frequency drives
6. Determination of parameters of three phase induction motor from No load Test and Blocked Rotor Test.
7. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
8. Performance of grid connected induction generator.
9. Determination of parameter of a single phase induction motor and study of
    a. Capacitor start induction motor
    b. Capacitor start and capacitor run induction motor
    c. Universal motor
    d. Shaded pole motor

ELECTRICAL AND ELECTRONICS MEASUREMENT

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE- I **[10 Hrs]**

University Portion (80%): (8 Hrs)

Measurement and Error: (2Hrs) Definition, Accuracy and Precision, Significant Figures, Types of Errors. **Text book-2-Ch-[1.1 to 1.4]**

Standards of Measurement: (1 Hrs) Classification of Standards, Electrical Standards, IEEE Standards. **Text Book-2- Ch-[3.1,3.4,3.6]**

Types of measuring instrument: (5 Hrs) Ammeter and Voltmeter: Derivation for Deflecting Torque of; PMMC, MI (attractionand repulsion types), Electro Dynamometer and Induction type Ammeters and Voltmeters. Energy meters and wattmeter.:Construction, Theory and Principle of operation of Electro-Dynamometer and Induction type wattmeter, compensation, creep, error, testing, Single Phase and Polyphase Induction type Watt-hour meters. Frequency Meters: Vibrating reed type, electrical resonance type, Power Factor Meters. **Text Book-1- Ch-[XVIII,XIX,XX,XXI,XXII]**

College/Institute Portion (20%): (2 Hrs)

Measuring instruments: Absolute and secondary instrument, indicating and recording instrument. **Text Book-1- Ch-XVII.**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE-II **[10 Hrs]**

University Portion(80%): (8 Hrs)

Measurement of Resistance, Inductance and Capacitance: (8 Hrs)

Resistance: Measurement of Low Resistance by Kelvin's Double Bridge, Measurement of Medium Resistance, Measurement of High Resistance, Measurement of Resistance of Insulating Materials, Portable Resistance Testing set (Megohmmeter), Measurement of Insulation Resistance when Power is ON, Measurement of Resistance of Earth Connections.

Inductance: Measurement of Self Inductance by Ammeter and Voltmeter, and AC Bridges (Maxwell's, Hay's, & Anderson Bridge), Measurement of Mutual Inductance by Felici's Method, and as Self Inductance.

Capacitance: Measurement of Capacitance by Ammeter and Voltmeter, and AC Bridges (Owen's, Schering & Wien's Bridge), Screening of Bridge Components and Wagnor Earthing Device. **Text Book-1- Ch-[VI, VII]**

College/Institute Portion (20%): (2 Hrs)

Transducer: Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo-electric tachometers, Hall Effect Transducer. (**Text Book-2- Ch-11.1 to 11.6).**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- III **[10 Hrs]**

University Portion (80%): (8 Hrs)

1. **Galvanometer: (5 Hrs)** Construction, Theory and Principle of operation of D'Arsonval, Vibration (Moving Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers.
2. **Potentiometer: (3 Hrs)** Construction, Theory and Principle of operation of DC Potentiometers (Crompton, Vernier, Constant Resistance, & Deflection Potentiometer), and AC Potentiometers (Drysdale-Tinsley & Gall-Tinsley Potentiometer). **Text Book-1- Ch-[VIII,IX]**

College/Institute Portion (20%): (2 Hrs)

pH- Meter, volt ratio boxes and other auxiliary apparatus. **Text Book-1- Ch- VIII.**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- IV **[10 Hrs]**

University Portion(80%): (8 Hrs)

3. **Current Transformer and Potential Transformer :(3 Hrs)** Construction, Theory, Characteristics and Testing of CTs and PTs.

4. **Electronic Instruments for Measuring Basic Parameters:(2 Hrs)** Amplified DC Meters, AC Voltmeters using Rectifiers, True RMS Voltmeter, Considerations for choosing an Analog Voltmeter, Digital Voltmeters (Block Diagrams only), Q-meter
5. **Oscilloscope:(3 Hrs)** Block Diagrams, Delay Line, Multiple Trace, Oscilloscope Probes, Oscilloscope Techniques, Introduction to Analog and Digital Storage Oscilloscopes, Measurement of Frequency, Phase Angle, and Time Delay using Oscilloscope.

Text Book-2- Ch- [6.2 to 6.9, 7.2, 7.6, 7.7]

College/Institute Portion (20%): (2 Hrs)

[Wave analyser and Counter. (**Text Book-2- Ch- 9.2,9.3,9.4,10.1)].** Or related advanced topics as decided by the concerned faculty teaching the subject.

Text Book(s):

1. Electrical Measurements and Measuring Instruments – Golding & Widdis – 5th Edition, Reem Publication.
2. Modern Electronic Instrumentation and Measurement Techniques – Helfrick & Cooper – Pearson Education.

Reference Book(s):

1. A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co.
2. Electronic Instrumentation – H C Kalsi – 2nd Edition, Tata McGraw Hill.
3. Electronic Measurement and Instrumentation – Oliver & Cage – Tata McGraw Hill.

ELECTRICAL AND ELECTRONICS MEASUREMENTLAB

Select any 8 experiments from the list of 10 experiments

1. Measurement of Low Resistance by Kelvin's Double Bridge Method.
2. Measurement of Self Inductance and Capacitance using Bridges.
3. Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.
4. Calibration of Voltmeters and Ammeters using Potentiometers.
5. Testing of Energy meters (Single phase type).
6. Measurement of Iron Loss from B-H Curve by using CRO.
7. Measurement of R, L, and C using Q-meter.
8. Measurement of Power in a single phase circuit by using CTs and PTs.
9. Measurement of Power and Power Factor in a three phase AC circuit by two-wattmeter method.
10. Study of Spectrum Analyzers.

ELECTROMAGNETIC THEORY

Theory L/T (Hours per week): 3/1, Credit: 4

Module – I (8 hours)

University Portion (80%):Co-ordinate systems & Transformation: Cartesian co-ordinates, circular cylindrical co-ordinates, spherical co-ordinates.

Vector Calculus: Differential length, Area & volume, Line surface and volume Integrals, Del operator, Gradient of a scalar, Divergence of a vector & divergence theorem, curl of a vector & Stoke's theorem, laplacian of a scalar **(Text Book 1: Chapter- 1, Chapter-2)**

College/Institute Portion (20%): Field: Scalar Field and Vector Field. Or related advanced topics as decided by the concerned faculty teaching the subject.

Module – II (11 hours)

University Portion (80%): Electrostatic Fields: Coulomb's Law, Electric Field Intensity, Electric Fields due to point, line, surface and volume charge, Electric Flux Density, Gauss's Law – Maxwell's Equation, Applications of Gauss's Law, Electric Potential, Relationship between E and V –Maxwell's Equation An Electric Dipole & Flux Lines, Energy Density in Electrostatic Fields., Electrostatic Boundary – Value Problems: Possion's & Laplace's Equations, Uniqueness theorem, General procedures for solving possion's or Laplace's Equation. **(Textbook-1: Chapter- 3, 4, 5.1 to 5.5)**

College/Institute Portion (20%): Nature of current and current density, the equation of continuity. Or related advanced topics as decided by the concerned faculty teaching the subject.

Module – III (8 hours)

University Portion (80%):

Magnatostatic Fields: Magnetic Field Intensity, Biot-Savart's Law, Ampere's circuit law-Maxwell Equation, applications of Ampere's law, Magnetic Flux Density-Maxwell's equations. Maxwell's equation for static fields, Magnetic Scalar and Vector potentials.**(Textbook-1: Chapter- 6.1 to 6.8)**

College/Institute Portion (20%): (2 hours) Energy in Magnetic Field Or related advanced topics as decided by the concerned faculty teaching the subject.

Module – IV (7 hours)

University Portion (80%): Electromagnetic Fields and Wave Propagation: Faraday's Law, Transformer & Motional Electromagnetic Forces, Displacement Current, Maxwell's Equation in Final forms, Time Varying Potentials, Time-Harmonic Field. Electromagnetic Wave Propagation: Wave Propagation in lossy Dielectrics, Plane Waves in loss less Dielectrics, Power & pointing vector. **(Textbook-1: Chapter-8.1 to 8.7, Ch.9.1 to 9.3 & 9.6)**

College/Institute Portion (20%): General Wave Equation, Plane wave in dielectric medium, free space, a conducting medium, a good conductor and good dielectric, Polarization of wave. Or related advanced topics as decided by the concerned faculty teaching the subject.

Text Book:

1. Matthew N. O. Sadiku, Principles of Electromagnetics, 4th Ed., Oxford Intl. Student Edition.

Reference Book:

1. C. R. Paul, K. W. Whites, S. A. Nasor, Introduction to Electromagnetic Fields, 3rd, TMH.
2. W.H. Hyat, Electromagnetic Field Theory, 7th Ed, TMH.

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	9

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS SUBJECT
ELECTRICAL ENGINEERING MATERIALS (4-0-0)

Module – I **(14 hours)**

Atomic bonding, crystallinity, Miller Indices, X-ray crystallorgraphy, structural imperfections, crystal growth. Free electron theory of metals, factors affecting electric conductivity of metals, thermal conductivity of metals, heat developed in current Carrying conductors, thermo electrice ffect, super conductivity**.**

Module – II **(10 hours)**

Polarization mechanism and dielectric constant, behavior of polarization under impulse and frequency switching, dielectric loss, spontaneous polarization, piezoelectric effect.Origin of permanent magnetic dipoles in materials, classifications, diamagnetism, paramagnetism, ferromagnetism, Magnetic Anisotropy magnetostriction.

Module – III **(14 hours)**

Energy band theory, classification of materials using energy band theory, Hall effect, drift and diffusion currents, continuity equation, P-N diode, volt-amp equation and its temperature dependence. Properties and applications of electrical conducting, semiconducting, insulating and magnetic materials.

Module – IV **(10 hours)**

Special purpose materials, Nickel iron alloys, high frequency materials, permanent magnet materials, Feebly magnetic materials, Ageing of a permanent magnet, Effect of impurities, Losses in Magnetic materials.

Text Books:-

1. A. J. Dekker, 'Electrical Engineering Materials', Prentice hall of India, India
2. C. S. Indulkar & S. Thiruvengadam, 'An introduction to Electrical Engineering Materials', S. Chand & Co., India
3. R. K. Rajput, 'Electrical Engineering Materials', Laxmi Publications, India

Reference Books:-

1. Ian P. Hones, 'Material Science for Electrical & Electronics Engineers', Oxford University Press
2. Electrical Property of Material by Lazlo Solimar, Oxford University Press
3. K. M. Gupta – Electrical Engineering Materials, Umesh Publication, 2nd edition 2003

MINOR
ELECTRICAL AND ELECTRONICS MEASUREMENT

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE- I **[10 Hrs]**

University Portion (80%): (8 Hrs)

Measurement and Error: (2Hrs) Definition, Accuracy and Precision, Significant Figures, Types of Errors. **Text book-2-Ch-[1.1 to 1.4]**

Standards of Measurement: (1 Hrs) Classification of Standards, Electrical Standards, IEEE Standards. **Text Book-2- Ch-[3.1,3.4,3.6]**

Types of measuring instrument: (5 Hrs) Ammeter and Voltmeter: Derivation for Deflecting Torque of; PMMC, MI (attractionand repulsion types), Electro Dynamometer and Induction type Ammeters and Voltmeters. Energy meters and wattmeter.:Construction, Theory and Principle of operation of Electro-Dynamometer and Induction type wattmeter, compensation, creep, error, testing, Single Phase and Polyphase Induction type Watt-hour meters. Frequency Meters: Vibrating reed type, electrical resonance type, Power Factor Meters. **Text Book-1- Ch-[XVIII,XIX,XX,XXI,XXII]**

College/Institute Portion (20%): (2 Hrs)

Measuring instruments: Absolute and secondary instrument, indicating and recording instrument. **Text Book-1- Ch-XVII.**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE-II **[10 Hrs]**

University Portion(80%): (8 Hrs)

Measurement of Resistance, Inductance and Capacitance: (8 Hrs)

Resistance: Measurement of Low Resistance by Kelvin's Double Bridge, Measurement of Medium Resistance, Measurement of High Resistance, Measurement of Resistance of Insulating Materials, Portable Resistance Testing set (Megohmmeter), Measurement of Insulation Resistance when Power is ON, Measurement of Resistance of Earth Connections.

Inductance: Measurement of Self Inductance by Ammeter and Voltmeter, and AC Bridges (Maxwell's, Hay's, & Anderson Bridge), Measurement of Mutual Inductance by Felici's Method, and as Self Inductance.

Capacitance: Measurement of Capacitance by Ammeter and Voltmeter, and AC Bridges (Owen's, Schering & Wien's Bridge), Screening of Bridge Components and Wagnor Earthing Device. **Text Book-1- Ch-[VI, VII]**

College/Institute Portion (20%): (2 Hrs)

Transducer: Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo-electric tachometers, Hall Effect Transducer. (**Text Book-2- Ch-11.1 to 11.6).**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- III **[10 Hrs]**

University Portion (80%): (8 Hrs)

6. **Galvanometer: (5 Hrs)** Construction, Theory and Principle of operation of D'Arsonval, Vibration (Moving Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers.
7. **Potentiometer: (3 Hrs)** Construction, Theory and Principle of operation of DC Potentiometers (Crompton, Vernier, Constant Resistance, & Deflection Potentiometer), and AC Potentiometers (Drysdale-Tinsley & Gall-Tinsley Potentiometer). **Text Book-1- Ch-[VIII,IX]**

College/Institute Portion (20%): (2 Hrs)

pH- Meter, volt ratio boxes and other auxiliary apparatus. **Text Book-1- Ch- VIII.**Or related advanced topics as decided by the concerned faculty teaching the subject.

MODULE- IV **[10 Hrs]**

University Portion(80%): (8 Hrs)

8. **Current Transformer and Potential Transformer :(3 Hrs)** Construction, Theory, Characteristics and Testing of CTs and PTs.
9. **Electronic Instruments for Measuring Basic Parameters:(2 Hrs)** Amplified DC Meters, AC Voltmeters using Rectifiers, True RMS Voltmeter, Considerations for choosing an Analog Voltmeter, Digital Voltmeters (Block Diagrams only), Q-meter
10. **Oscilloscope:(3 Hrs)** Block Diagrams, Delay Line, Multiple Trace, Oscilloscope Probes, Oscilloscope Techniques, Introduction to Analog and Digital Storage Oscilloscopes, Measurement of Frequency, Phase Angle, and Time Delay using Oscilloscope.

    Text Book-2- Ch- [6.2 to 6.9, 7.2, 7.6, 7.7]

College/Institute Portion (20%): (2 Hrs)

[Wave analyser and Counter. (**Text Book-2- Ch- 9.2,9.3,9.4,10.1)].** Or related advanced topics as decided by the concerned faculty teaching the subject.

Text Book(s):

3. Electrical Measurements and Measuring Instruments – Golding & Widdis – 5th Edition, Reem Publication.
4. Modern Electronic Instrumentation and Measurement Techniques – Helfrick & Cooper – Pearson Education.

Reference Book(s):

4. A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co.
5. Electronic Instrumentation – H C Kalsi – 2nd Edition, Tata McGraw Hill.
6. Electronic Measurement and Instrumentation – Oliver & Cage – Tata McGraw Hill.

ELECTRONICS AND COMMUNICATION ENGINEERING/ ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ANALOG ELECTRONICS CIRCUIT (3-0-2)

MODULE – I **(12 Hours)**

MOS Field-Effect Transistor: Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. (4 Hours)

Biasing of BJTs: Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples. (4 Hours)

Biasing of FETs and MOSFETs: Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

MODULE – II **(12 Hours)**

Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of R_S and R_L on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits. (6 Hours)

Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of R_{SIG} and R_L on CS Amplifier; Source Follower and Cascaded System. (6 Hours)

MODULE – III **(5 hours)**

High Frequency Response of FETs and BJTs: High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (5 Hours)

MODULE – IV (9 hours)

Feedback amplifier and Oscillators: Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)

Operational Amplifier: Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. (5Hours)

Additional Module (Terminal Examination-Internal) **(6 hours)**

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and μA 741, Signal Generators using OPAMP: Square, triangle and ramp generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

Text Books

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9th/10th Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2nd Edition,2008.

Reference Books

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5th Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2nd Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5thedition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009

ANALOG ELECTRONICS CIRCUIT LAB

List of Experiments

(At least 10 out of 12 experiments should be done)

1. Design and simulate BJT bias circuit and compare the results.
2. Design and simulate JEET/MOSFET bias circuit and compare the results.
3. Design and simulate BJT common-emitter circuit and compare D.C and A.C performance:
4. Design and simulate JFET/MOSFET common-emitter circuit and compare D.C and A.C performance:
5. Determining the frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response and compare with simulated results.
6. Differential amplifiers circuits: D.C bias and A.C operation without and with current source.
7. Study of Darlington connection and current mirror circuits.
8. OP-Amp Frequency Response and Compensation.
9. Application of Op-Amp as differentiator, integrator, square wave generator.
10. Obtain the band width of FET/ BJT using Square wave testing of an amplifier.
11. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
12. Class A and Class B Power Amplifier.

NETWORK THEORY(3-0-2)

MODULE- I (10 Hrs)

Network Topology:Graph of a network; Concept of tree; Incidence matrix; Tie-setmatrix; Cut-set matrix; Formulation and solution of network equilibrium equations on loop and node basis.

Network Theorems & Coupled Circuits:Substitution theorem; Reciprocity theorem; Maximum power transfer theorem; Tellegen's theorem; Millman's theorem; Compensation theorem; Coupled Circuits; Dot Convention for representing coupled circuits; Coefficient of coupling.

MODULE- II (08 Hrs)

Laplace Transform & Its Application:Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).

MODULE- III (08 Hrs)

Two Port Network Functions & Responses: z, y, ABCD and **h**-parameters; Reciprocity and Symmetry; Interrelation of two-port parameters, Interconnection of two-port networks; Network Functions; Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

MODULE- IV (08 Hrs)

Fourier Series and Fourier Transform: Fourier series, Fourier analysis and evaluation of coefficients; Steady state response of network to periodic signals; Fourier transform and convergence; Fourier transform of some functions; Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.

Additonal Module (Terminal Examination-Internal) (08 hours)

Network Synthesis: On network synthesis.

Text Book(s)

1. Network Analysis, M E Van Valkenburg, PHI, third edition.
2. Fundamentals of Electric Circuits, Charles K Alexander & Mathew N.O. Sadiku, Tata McGraw Hill, fifth edition.

Reference Book(s)

1. Network Theory, Smarajit Ghosh, PHI, first edition(2005)
2. Network Theory, P K Satpathy, P Kabisatpathy, S P Ghosh and A K Chakraborty Tata McGraw Hill, New Delhi.
3. Fundamentals of Network analysis and Synthesis, K.M.Soni, S.K.Kataria and Sons (2010) ninth edition
4. Network Analysis and Synthesis, Franklin F. Kuo ,Wiley Student Edition, second edition 2006

NETWORK THEORY LAB

List of Experiments
(At least 8 out of 10 experiments should be done)

1. Verification of Network Theorems (Superposition, Thevenin, Norton, Maximum Power Transfer).
2. Study of DC and AC Transients.
3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
4. Determination of circuit parameters: Hybrid and Transmission parameters.
5. Frequency response of Low pass and High Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series circuit.
9. Study of resonance in R-L-C parallel circuit.
10. Spectral analysis of a non-sinusoidal waveform.

SIGNALS & SYSTEMS (3-0-2)

MODULE – I (10 Hours)

Discrete-Time Signals and Systems:
Discrete-Time Signals: Some Elementary Discrete-Time signals, Classification of Discrete-Time Signals, Simple Manipulation, Discrete-Time Systems : Input-Output Description, Block Diagram Representation, Classification, Interconnection; Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems; Discrete-Time Systems Described by Difference Equations; Implementation of Discrete-Time Systems. Correlation of Discrete-Time Signals: Cross correlation and Autocorrelation Sequences, Properties.

MODULE – II (10 Hours)

The Continuous-Time Fourier Series:
Basic Concepts and Development of the Fourier series; Calculation of the Fourier Series, Properties of the Fourier Series.

The Continuous-Time Fourier Transform:
Basic Concepts and Development of the Fourier Transform; Properties of the Continuous-Time Fourier Transform.

MODULE- III (10 Hours)

The Z-Transform and Its Application to the Analysis of LTI Systems:
The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals, The System Function of a Linear Time-Invariant System; Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion; The One-sided Z-Transform: Definition and Properties, Solution of Difference Equations.

MODULE- IV (6 Hours)

The Discrete Fourier Transform: Its Properties and Applications:
Frequency Domain Sampling: The Discrete Fourier Transform; Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Additional DFT Properties.

Additonal Module (Terminal Examination-Internal) (04 Hours)

Properties of Continuous-Time Systems:
Block Diagram and System Terminology; System Properties: Homogeneity, Time Invariance, Additivity, Linearity and Superposition, Stability, Causality.

Text Books

1. Digital Signal Processing – Principles, Algorithms and Applications, John. G. Proakis and Dimitris. G. Manolakis, 4th Edition, Pearson.
2. Fundamentals of Signals and Systems - M. J. Roberts, TMH
3. Signal & Systems by Tarun Kumar Rawat, Oxford University Press.

Reference Books

1. Signals and Systems - P. Ramakrishna. Rao, TMH.
2. Signals and Systems – A NagoorKani, TMH
3. Signals and Systems, Chi-Tsong Chen, Oxford
4. Principles of Signal Processing and Linear Systems, B.P. Lathi, Oxford.
5. Principles of Linear Systems and Signals, B.P Lathi, Oxford

SIGNALS AND SYSTEMS LAB

List of Experiments:

(At least 10 out of 15 experiments should be done)

1. Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.
2. Find the Fourier transform of a square pulse .Plot its amplitude and phase spectrum.
3. Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.
4. Write a program to find the trigonometric Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings.
5. Write a program to find the trigonometric and exponential Fourier series coefficients of a periodic rectangular signal. Plot the discrete spectrum of the signal.
6. Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
7. The signal x (t) is defined as below. The signal is sampled at a sampling rate of 1000 samples per second. Find the power content and power spectral density for this signal.

$$x(t) = \begin{cases} \cos(2\pi \times 47t) + \cos(2\pi \times 219t), & 0 \le t \le 10 \\ 0 & otherwise \end{cases}$$

8. Write a program to find the magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
9. Write a program to find the response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
10. Write a program to find the autocorrelation and cross correlation of sequences.
11. Generate a uniformly distributed length 1000 random sequence in the range (0,1). Plot the histogram and the probability function for the sequence. Compute the mean and variance of the random signal.
12. Generate a Gaussian distributed length 1000 random sequence. Compute the mean and variance of the random signal by a suitable method.
13. Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.
14. Generate a discrete time sequence of N=1000 i.i.d uniformly distributed random numbers in the interval (-0.5,-0.5) and compute the autocorrelation of the sequence.
15. Obtain and plot the power spectrum of the output process when a white random process is passed through a filter with specific impulse response

DIGITAL ELECTRONICS (3-0-2)

University Level:

MODULE – I (12 Hours)

Number System: Introduction to various number systems and their Conversion. Arithmetic Operation using 1's and 2`s Compliments, Signed Binary and Floating Point Number Representation Introduction to Binary codes and their applications. (**5 Hours)**

Boolean Algebra and Logic Gates: Boolean algebra and identities, Complete Logic set, logic gates and truth tables. Universal logic gates, Algebraic Reductionand realization using logic gates **(3 Hours)**

Combinational Logic Design: Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations. **(4 Hours)**

MODULE – II (14 Hours)

Logic Components: Concept of Digital Components, Binary Adders, Subtraction and Multiplication, An Equality Detector and comparator, Line Decoder, encoders, Multiplexers and De-multiplexers. **(5 Hours)**

Synchronous Sequential logic Design: sequential circuits, storage elements: Latches (SR, D), Storage elements: Flip-Flops inclusion of Master-Slave, characteristics equation and state diagram of each FFs and Conversion of Flip-Flops. Analysis of Clocked Sequential circuits and Mealy and Moore Models of Finite State Machines **(6 Hours)**

Binary Counters : Introduction, Principle and design of synchronous and asynchronous counters, Design of MOD-N counters, Ring counters. Decade counters, State Diagram of binary counters (4 hour)

MODULE – III (12 hours)

Shift resistors: Principle of 4-bit shift resistors. Shifting principle, Timing Diagram, SISO, SIPO ,PISO and PIPO resistors. (4 hour)

Memory and Programmable Logic: Types of Memories, Memory Decoding, error detection and correction), RAM and ROMs. Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices. **(5 Hours)**

IC Logic Families: Properties DTL, RTL, TTL, I^2L and CMOS and its gate level implementation. A/D converters and D/A converters **(4 Hours)**

College Level (20%)

Basic hardware description language: Introduction to Verilog/VHDL programming language, Verilog/VHDL program of logic gates, adders, Substractors, Multiplexers, Comparators, Decoders flip-flops, counters, Shift resistors.

Text book:

1. Digital Design, 3rd Edition, Moris M. Mano, Pearson Education.
2. Fundamentals of digital circuits, 8^{th} edition, A. Anand Kumar, PHI
3. Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.

Reference Book:

1. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
2. A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
3. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.

DIGITAL ELECTRONICS LAB

List of Experiments:

(At least 10 experiments should be done, Experiment No. 1 and 2 are compulsory and out of the balance 8 experiments at least 3 experiments has to be implemented through both Verilog /VHDL and hardware implementation as per choice of the student totaling to 6 and the rest 2 can be either through Verilog /VHDL or hardware implementation.)

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NANDGate.
2. Gate-level minimization: Two level and multi level implementation of Booleanfunctions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, code converters, gray code to binary and 7 segmentdisplay.
4. Design, implement and test a given design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number ofGates.
5. Design with multiplexers andde-multiplexers.
6. Flip-Flop: assemble, test and investigate operation of SR, D & J-Kflip-flops.
7. Shift Registers: Design and investigate the operation of all types of shift registers with parallelload.
8. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallelload.
9. Memory Unit: Investigate the behaviour of RAM unit and its storage capacity – 16 X 4 RAM: testing, simulating and memoryexpansion.
10. Clock-pulse generator: design, implement andtest.
11. Parallel adder and accumulator: design, implement andtest.
12. Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bitproduct.
13. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 3 to 12

SEMICONDUCTOR DEVICES(3-1-0)

MODULE-I (10 Hours)

Introduction to the quantum theory of solids: Formation of energy bands; the k-space diagram (two and three dimensional representation), conductors, semiconductors and insulators.

Electrons and Holes in semiconductors: Silicon crystal structure; Donors and acceptors in the band model; electron effective mass; Density of states; Thermal equilibrium; and Fermi-Dirac distribution function for electrons and holes; Fermi energy. Equilibrium distribution of electrons & holes: derivation of *n* and *p* from D(E) and f(E), Fermi level and carrier concentrations; The *np* product and the intrinsic

carrier concentration. General theory of *n* and *p;* Carrier concentrations at extremely high and low temperatures: complete ionization, partial ionization and freeze-out; Energy-band diagram and Fermi-level, Variation of E_F with doping concentration and temperature.

MODULE-II (10 Hours)

Motion and Recombination of Electrons and Holes: Carrier drift: Electron and hole mobilities; Mechanism of carrier scattering; Drift current and conductivity.

Motion and Recombination of Electrons and Holes (continued): Carrier diffusion: diffusion current, Total current density; relation between the energy diagram and potential, electric field; Einstein relationship between diffusion coefficient and mobility; Electron-hole recombination; Thermal generation.

PN Junction: Building blocks of the pn junction theory: Energy band diagram and depletion layer of a pn junction, Built-in potential; Depletion layer model: Field and potential in the depletion layer, depletion-layer width; Reverse-biased PN junction; Capacitance-voltage characteristics; Junction breakdown: peak electric field. Tunneling breakdown and avalanche breakdown; Carrier injection under forward bias-Quasi-equilibrium boundary condition; current continuity equation; Excess carriers in forward-biased pn junction; PN diode I-V characteristic, Charge storage.

MODULE-III (10 Hours)

The Bipolar Transistor: Introduction, Modes of operation; Minority Carrier distribution, Collector current, Base current, current gain, Base width Modulation by collector current, Breakdown mechanism, Equivalent Circuit Models – Ebers -Moll Model.

MODULE-IV (12 Hours)

Metal-Semiconductor Junction: Schottky Diodes: Built-in potential, Energy-band diagram, I-V characteristics, Comparison of the Schottky barrier diode and the pn-junction diode; Ohmic contacts: tunneling barrier, specific contact resistance**.**

MOS Capacitor: The MOS structure, Energy band diagrams, Flat-band condition and flat-band voltage, Surface accumulation, surface depletion, Threshold condition and threshold voltage, MOS C-V characteristics, Q_{inv} in MOSFET.

Additonal Module (Terminal Examination-Internal) (06 Hours)

MOS Transistor: Introduction to the MOSFET, Complementary MOS (CMOS) technology, V-I Characteristics; Surface mobilities and high-mobility FETs, JFET, MOSFET V_t; Body effect and steep retrograde doping, pinch-off voltage,

Text Books

1. Semiconductor Physics and Devices-Donald A. Neamen, Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition.
2. Solid State Electronics Devices-Ben. G. Streetman and Sanjay Banarjee, Pearson Education, New Delhi, 6th Edition.

Reference Books

1. Modern Semiconductor Devices for Integrated Circuits-Chenming Calvin Hu, Pearson Education/Prentice Hall, 2009.
2. Physics of Semiconductor Devices-S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi, 3rd Edition.
3. Physics of Semiconductor Devices-Dillip K. Roy, University Press (India) Pvt. Ltd., Hyderabad, 2nd Edition
4. Semiconductor Physics and Devices- Fowler, Oxford University Press.
5. Solid State Electronics Devices-D.K. Bhattacharya and Rajnish Sharma, Oxford University Press, New Delhi, 2nd Edition
6. Fundamentals of Semiconductor Devices-M.K. Achuthan and K.N. Bhatt, Tata McGraw Hill Publishing Company Limited, New Delhi.

ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).	10

	Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	**9**
04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS SUBJECT

PROBABILITY AND RANDOM PROCESSES(4-0-0)

MODULE-I (06 Hours)

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events:

MODULE-II (08 Hours)

The Random Variable : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

MODULE-III (08 Hours)

Operation on one Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable, Transformation of a Discrete-Random-Variable.

MODULE-IV (10 Hours)

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal-Distributions.

Additonal Module (Terminal Examination-Internal) (10 Hours)

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations-of-Gaussian-Random-Variables.

Text Books

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.

Reference Books

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
2. Communication Systems Analog & Digital – R.P. Singh and S.D. Sapre, TMH, 1995.
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
4. Probability Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.
5. Statistical Theory of Communication - S.P. Eugene Xavier, New Age Publications, 2003.
6. Fundamentals of applied Probability and Random Processes-Oliver C. Ibe, Elsevier Academic press.
7. Probability& Random Processes for Electrical Engineering" by Alberto Leon-Garcia, Pearson education, 2nd edition

ANALOG ELECTRONICS CIRCUIT (3-0-2)(Minor Subject)

MODULE – I **(12 Hours)**

MOS Field-Effect Transistor: Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E-MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch. (4 Hours)

Biasing of BJTs: Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples. (4 Hours)

Biasing of FETs and MOSFETs: Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

MODULE – II **(12 Hours)**

Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of R_S and R_L on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits. (6 Hours)

Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of R_{SIG} and R_L on CS Amplifier; Source Follower and Cascaded System. (6 Hours)

MODULE – III **(5 hours)**

High Frequency Response of FETs and BJTs: High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier. (5 Hours)

MODULE – IV (9 hours)

Feedback amplifier and Oscillators: Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)

Operational Amplifier: Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier. (5Hours)

Additional Module (Terminal Examination-Internal) **(6 hours)**

Basic analysis of difference amplifier, Simulation of analog circuits i.e., different single and cascaded amplifier circuits, difference amplifier circuits and validating the theoretical parameters using PSpice and MULTISIM. Analysis op-amp IC circuits using LF411 and μA 741, Signal Generators using OPAMP: Square, triangle and ramp generator circuits using opamps - Effect of slew rate on waveform generation-introduction to analog simulation OPAMP as nonlinear element: comparator, Voltage controlled oscillator (VCO). Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier

Text Books

1. Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9th/10th Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
2. Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2nd Edition,2008.

Reference Books

1. Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5th Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
2. Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, (*For Problem Solving*)
3. Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition,2002.
4. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2nd Edition.2004.
5. Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
6. Electronic device and circuits, David A. Bell, Oxford University Press, 5thedition,2008.
7. Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009