V SEMESTER B.E. (CIVIL)

5BECE -001: ENVIRONMENTAL ENGINEERING –II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	0	2	3	10	10	80	100

UNIT	TOPIC	HRS
UNIT I	INTRODUCTION:Necessity for sanitation, methods of domestic waste water disposal, types of sewerage systems and their suitability.Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of designflow, estimation of storm flow, rational method and empirical formulae of design of storm water drain. DESIGN OF SEWERS:Hydraulic formulae for velocity, effects of flow variations on velocity, self cleansing and non scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full.MATERIALS OF SEWERS:Sewer materials, shapes of sewers, laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers.	**9**
UNIT II	SEWER APPURTENANCES:Catch basins, manholes, flushing tanks, oil and grease traps, Drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage.WASTE WATER CHARACTERIZATION:Physical, Chemical and Biological characteristics, Aerobic and Anaerobic activity. BOD and COD, theirsignificance & problems	**9**
UNIT III	TREATMENT OF WASTE WATER:Flow diagram of municipal waste water treatment plant.Preliminary & Primary treatment:Screening, grit chambers, skimming tanks, primary sedimentation tanks Design criteria & Design examples.	**9**
UNIT IV	SECONDARY TREATMENT:Suspended growth and fixed film bioprocess. Trickling filter –theory and operation, types. Activated sludge process-Principle and flow diagram, Modifications of ASP, F/M ratio.(No design), Anaerobic Sludge digestion, Sludge digestion tanks, Sludge drying beds. Low cost waste treatment method. Septic tank with design, Oxidation Pond and Oxidation ditches	**9**
UNIT V	Introduction to industrial waste water treatment (flow equalization, neutralization, adsorption, chemical & biological treatment etc.).DISPOSALOF EFFLUENTS:Disposal of Effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Effluent Disposal standards for land & surface water.	**9**

TEXT BOOKS/REFERENCE BOOKS:

1.B.C.Punmia,"Waste Water Engineering" -Laxmi Publication

2.S.K.Garg, "Environmental Engineering" -Vol II Standard Publication.

3.Manual on Waste Water Treatment: CPHEEO, Ministry of Urban Development, New Delhi.

4.Environmental Engineering: Howard S. Peavy, Donald R. Rowe, George Tchnobanoglous McGraw Hill InternationalEdition.

5.Water and Wastewater Engineering Vol-II:-Fair, Geyer and Okun : John Willey Publishers, New York.

6.Waste Water Treatment, Disposal and Reuse:Metcalf and Eddy Inc:Tata McGraw Hill Publications.

5BECE-002–TRANSPORTATION ENGINEERING-I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	3	0	2	3	10	10	80	100

UNIT	TOPIC	HRS
UNIT I	1.Development and Planning :Road transport Characteristic, Classification of roads, development plants, network patterns, data collection and surveys, principles of alignment, evaluation of plan proposals. 2.Traffic Engineering:3E`s of, traffic characteristics, Surveys, Intersection-type, layouts, design principles, Urban traffic, parking, lighting, Accidents, Traffic control Devices-marking, Sign, Singals, Regulation Motor Vehicle Act and rule.	**10**
UNIT II	3. Geometric Design :Road , road user & road vehicle characteristica, Factors affecting design standards. Cross Section elements, stopping & overtaking sight distance overtaking zones. Horizontal alignment –Curves, design of super elevation, widening, transition curves, vertical alignments, Design of summit & Valley Curves, I.R. C. standards for Geometric Design, Geometric, Geometrics of Hill Roads. 4.Pavement Design: Types of pavement & Characteristic, Design parameters, Axel & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & CBR method of flexible pavement design. Analysis of load & temperature stresses of rigid pavement, Joints.	**10**
UNIT III	5.Materials: Subgrade Soil –AASHO Classification, group Index, Subgrade soil Stabilization. CBR, aggregates physical and mechanical propertis & tests-Bituminous materials classification sources properties and tests. Cutback & Emulsions, IRC/IS standards, Introduction to Geotextiles. 6.Construction & Maintenance: IRC, most specifications for quality &quantity highway construction and maintenance of earthen / gravel road , WBM and WMM , Bituminous pavement , cement concrete pavement, pavement failures .	**10**
UNIT IV	7 General: Components, classification and Identification, Data Collection site Selection. Economic Span. 8 Hydrology: Estimaton of flood, discharge, water way, scour depth, depth of Foundation, Afflux, clearance and free board. 9 Loads , Forces , Stresses : IRC Specification & code of practices, critical Combinations. 10 Sub-Structure :(A)Types of foundations & their choice, estimation of BC of foundation strata, Open, pile and well foundation , pneumatic Caissions, cofferdams .(B)Abutment, piers & Wingwalls Their types general design principles (Empirical), Choice.	**10**
UNIT V	11. Super Structure:Different structural forms culverts, causeways, minor and major bridges, suitability and choice precost, post tensioned and segmental Construction. Launching, operation systems, Bearings, Architecture. 12. Rating and Maintenance:Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention,Aesthetics.	**10**

TEXT BOOK/ REFERENCE BOOKS

1.Highway Engineering Khanna and JustoNem Chand

2.Bridge Engineering by S.P.BrindraDhanpat Rai Publication

3.Bridge Engineering by S.C.RangwalaCharotar Publishing House Ptv

4.Principles and practices of Highway Engineering by S.K. Sharma Khanna Publication

5Pavement Design : Yoder and WitzakWiley

6 Traffic Engineering : L.R.KadiyaliKhanna Publishers

Course Code: 5BECE 007 :Transportation Engineering-1

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**TOTAL**
		3	**2**	**25**	**25**	**50**

EVERY STUDENTMUST CARRY MINIMUM OF 10 EXPERIMENTS FROM THE FOLLOWING

1.Sub grade soil : CBR test
2.Sub grade soil : AASHO Classification (grouter index)
3.Aggregates : crushing value test
4.Aggregates : Los Angeles abrasion value test
5.Aggregates : impact test
6.Aggregates : shape test. (Elongation index , flakiness index and Soundness test)
7.Aggregates : Specific Gravity and Water absorption test
8.Bitumen : Penetration value
9.Bitumen : Ductility Test
10.Bitumen : Softening point test.
11.Bitumen : Flash and firepoint test
12.Bitumen : Specific gravity
13.Bitumen : Adhesion Test.
14.Short Field Vi

5BECE003: DESIGN OF RCC STRUCTURES - I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	3	4	3	4	10	10	80	100

UNIT	TOPIC	HRS
UNIT I	Introduction to the Working Stress Method of RCC design. Basic concepts in a Design for flexure, assumptions, design constants Analysis of the rectangular Section, Balance, under-reinforced and over-reinforced sections. Drawbacks and limitations of Working stress method , shear reinforcement. Design of singly reinforced , doubly reinforced beam and T-beam by WSM.	**8**
UNIT II	Introduction to Limit State Design: Concept of probabilistic design and limit State design. Characteristic values, partial safety factors, stress strain Relationship stress block parameters, failure criteria, types and properties of Reinforcement, limit state of serviceability and limit state of collapse. Other Limit states. Review of IS – 456-2000. Limit state of Collapse in Shear & Bond: Design of beam for shear, shear Span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and axial force, Check for development length.. Limit state of collapse in flexure: Analysis and design of singly reinforced Rectangular section. Doubly reinforced rectangular section . Balance failure mode, primary tension failure mode and Primary compression failure mode	**8**
UNIT III	Limit state of Collapse in Flexure : Analysis & Design of the Tee & L-beam Section. Limit state of collapse in compression: Analysis & design of short axially Loaded column. Columns subjected to uniaxial bending, development and use of interaction Curves. Unsupported length , End condition . introduction to long columns. Limit state of Serviceability (i) Causes and control of cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced Cracks, Cracks due to loading. Needs for crack width control. (ii) Moment curvature relationship; deflection control of beams and One Way slabs. (no numerical calculation) (iii) Deflection control, calculation of deflection for simply supported beams acceptance criteria need of deflection control.	**12**
UNIT IV (WSM)	Design of circular water tank with roof slab/ dome resting on ground by Approximate methods/ IS code method. Design of rectangular water tank with one-way roof slab resting on ground by Approximate method/IS code method. Design of prestressed slab/ rectangular beam. Prestressed Concrete :Properties of high grade materials, concepts of Prestressed concrete, methods of prestressing, losses in prestressing. Various systems for prestressing with particular reference to Freyssined Magnel Blatton and Fifford Udall systems. Analysis of rectangular, T and I Section.	**5** **5**
UNIT V (LSM)	Design of one-way, simply supported, single span and cantilever slabs, and Continuos slab/ beam with IS coeffcients. Design of rectangular pad/ slopped footing for axial load Design of Dog-legged and open well staircases	**7**

TEXT BOOKS/REFERENCE BOOKS:

Reinforced concrete structures- S.N.Sinha ,

- Limit State Design ofRCC Structuresby A.K. Jain, B.C.Punmiya
- Limit State Design of RCC Strucutres: Based on IS : 800-2007 – Ashok K. Jain

I S 456 – 2000, I. S. 875 - , I. S. 3370 part IV, IS 1343

Reinforced Concrete Structures by N. Krishna Raju

Course Code: 5BECE-008 Design of RCC Structures - I

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**TOTAL**
		3	**2**	**25**	**25**	**50**

Practical shall consist of minimum four design assignments on above with detailed drawing on A-2size sheets and detailed calculations in journal.

1.Single span prestressed concrete rectangular beam/ slab.

2.One-way slab, continuous slab/beam

3.Rectangular pad / slopped footing./ circular footing

4.Dog-legged and Open Well Staircases

5. One field visit and its report in the journal

5BECE-004: BUILDING DESIGN & DRAWING

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
2	0	3	0	2	4	10	10	80	100

UNIT	TOPIC	HRS
UNIT I	Introduction :Importance of Building drawing as Engineer'sLanguage in construction & costing.Designing of Buildings :Introduction : Site requirements, requirements of owner and Building byelaws. Climate and design consideration, orientation, recommendations of CBRI, Roorki and general principles of planning with emphasis on functional planning. Free hand dimensioned sketches of various building elements. Importance in Civil Engineering.	**4**
UNIT II	Method of Drawing :Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962.(ii-a) Developing working drawings to scale as per I. S. 962 form the given sketch design and general specifications for terraced and pitched roofs.(ii-b) Developing submission drawings to scale with location site and block plan complete.	**6**
UNIT III	Graph paper design (line plans)based on various requirements for residential, public, education and industrial buildings	**2**
UNIT IV	Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc	**3**

Question paper pattern

Unit I, Unit III, Unit IV–(Three question Carries total 40marks)

Unit II –compulsory –(max –marks-40)

Textbook/References

1.Planning and designing of residential buildings-Y N RajaRao and Y Subramanyam-Standards publishers distributors

2.Building Drawing-Shah M H, Kale C M.-Tata McGraw Hill publications.

3.Building Construction-Rangawala S C-Charotar publications.

4.IS962 Code for practice for architectural and building drawings

5.IS 10714Part25-Technical Drawings-General principles of presentation

Course Code: 6BECE 009: Building Design & Drawing (P)

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**TOTAL**
		3	**2**	**25**	**25**	**50**

Assignments:-

1.free hand self explanatory dimensioned sketches of various building , types of lines etc. 2.Development of plans for residential building , with load beam structure with location plan , site plan and block paln etc.

3.Developing submission drawings for single storey residential building flat roof framed structure with access to terrace with location plan, site plan and block plan.

4.Developing submission drawings for double storey residential building load bearing structurewith flat roof to scale with location plan, site plan and block plan, etc.

5.Graph paper design (line plans) based on various requirements for public buildings like hospital / hostel /bank/library etc.(Any two)

6.Graph paper design (line plans) based on various requirements for shopping complex /primary school building , industrial building etc.

7Developing submission drawings for multi-storey commercial building load bearing structurewith flat roof to scale with location plan, site plan and block plan etc.

8Two point perspective of the single storied Residential building neglecting small buildingelements. (Pitched roof / flat roof) (Any one)

9Tracing of sheet of any one drawing sheet

10Ammonia print of any one drawing sheet

5BECE-005 : SURVEYING & LEVELING — II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	3	0	2	3	10	10	80	100

UNIT	TOPIC	HRS
UNIT I	TACHEOMETRIC SURVEYINGTacheometric systems -Tangential, stadia and subtense methods -Stadia systems -Horizontal and inclined sights -Vertical and normal staffing -Fixed and movable hairs -Stadia constants -Anallactic lens -Subtense bar.	**6**
UNIT II	CONTROL SURVEYINGWorking from whole to part -Horizontal and vertical control methods -Triangulation -Signals -Base line -Instruments and accessores -Corrections -Satellite station -Reduction to centre -Trignometric levelling -Single and reciprocal observations -Modern trends –Bench marking	**8**
UNIT III	CURVESSimple Compound, Reverse Curves, Vertical Curves. Simple Curves : Elements of simple curves, methods of curve ranging, obstacles in setting out curves.Compound Curves :Elements of compound Curves, setting out the curve.Reverse Curves : Elements of reverse Curves, setting out the curve. Vertical Curves : Elements of vertical curves, types, tangent correction, location of highest or lowest point.Transition Curves : Elements of transition curves, superelevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.	**13**
UNIT IV	ASTRONOMICAL SURVEYINGCelestial sphere -Astronomical terms and definitions -Motion of sun and stars -Apparent altitude and corrections -Celestial co-ordinate systems -Different time systems -Nautical almanac -Star constellations -Practical astronomy -Field observations and calculations for azimuth	**11**
UNIT V	OTHER TOPICSPhotogrammetry -Introduction -Terrestial and aerial Photographs -Stereoscopy -Parallax -Electromagnetic distance measurement -Carrier waves -Principles -Instruments -Trilateration -Hydrographic Surveying -Tides -MSL -Sounding methods -Location of soundings and methods -Three point problem -Strength of fix -Sextants and station pointer -River surveys -Measurement of current and discharge -Cartography -Cartographic concepts and techniques -Cadastral surveying -Definition -Uses -Legalvalues -Scales and accuracies.	**12**

TEXT BOOKS/REFERENCES

1. Surveying: Vol.I and Vol. II by Dr. B.C. Punmia , Laxmi Publication-New Delhi.
2. Surveying and Levelling Vol. II by T.P. Kanerkar and S.v. Kulkarni, Pune Vidyarthi Publication.
3. Surveying-Vol. II and III by Dr. K.R. Arora Standard Book House.
5.Surveying Vol.2 by S.K. Duggal, Mc Graw Hill Publication.
6.Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
7.Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989.
8.Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971
9.Elements of Photogrammetry by Paul R. Wolf. McGraw Hill Publication,..

Course Code: 6BECE 010 : Surveying –II Practicals (Any Six)

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**TOTAL**
		3	**2**	**25**	**25**	**50**

Practicals

1Determination of height and distance when the Instrument station is in the same verticalplane.

2Determination of height and distance (Base of the object inaccessible) –when theinstrument station is not in the same vertical plane.

3Determination of Tachometer constants, distance and elevation by stadia method.

4Contouring by tacheometric method.

5Setting out simple circular curve by linear method.

6Setting out simple circular curve by angular method.

7Determination of True North by astronomical survey

8Demonstration of EDM, Total Station.II. Survey camp: On any of following for minimum two days1Road Project2Irrigation Project3Water Supply Projec

5BECE006: PROGRAMME ELECTIVE - I

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	3	3	10	10	80	100

01 Numerical Methods in Engineering
02 Materials Testing & Evaluation
03 Engineering Management

01 Numerical Methods in Civil Engineering

Course Contents

UNIT-I

Basis of Computations, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Cholesky Decomposition method, Gauss Jordan and Gauss Sceidal Methods

UNIT-II

Roots of Equation, Trial and Error, Bisection, Secant Iteration, Newton Rapson Method, Solution of Ordinary Differential Equation, Euler's Method, Modified Euler's Method and Runga Kutta Methods.

UNIT-III

Interpolation with Newton©s Divided Differences, Lagrange©s Polynomial,Finite Difference Method, Central, Forward and Backward Differences, Least Square Polynomial Approximations Application in Deflection of Determinate Beams, Buckling Load of Long Columns

UNIT-IV

Numerical Integration: Trapezoidal Rule, Simpon's Rules, Gauss Quadrature Rules

UNIT-V

Statistical Analysis of Experimental Data, Mean, Median, Mode, Deviation, Measures of Dispersion, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

Text Books

- Balaguruswami E., "Numerical Methods", Tata Mc-Graw Hill
- Scheid F, "Numerical Analysis (Schaum's series)", Tata Mc-Graw Hill
- Chapra. S. C. and Canale R. P., "Numerical Methods for Engineers", by, Tata Mc-Graw Hill
- Shantha Kumar M , "Computer Based Numerical Analysis", Khanna Publication

  Grewal B.S. and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publication, N. Delhi
- Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi

Reference Books

· Jain, Aryengon, “Numerical Methods for Scientific and Engineering Applications”, Wiley Eastern Publication

· Numerical Recipe , Oxford Publishing

· Manuals for the Commercial Computer Programmes

02 Materials Testing and Evaluations

Course Contents

UNIT-I

Stones: Classification, Stone quarrying, Machines for quarrying, Blasting, Dressing of stones, Use of stones, Natural bed of stones, Deterioration of stones, Retardation of decay of stones, Preservation of stones, Artificial stones, Common building stones of India, Qualities of a good building stones, Tests of stones.

Bricks: Comparison of brickwork and stonework, Brick earth, Classification of brick earth, Manufacture of bricks, Clamp-burning and kiln-burning, Qualities of good bricks, Strength of bricks, Tests for bricks, Classification of bricks, Use of bricks, Colour, size and weight of bricks, Shape of bricks, Fire-clay, Fire-bricks, Substitutes for bricks.

Clay Products and Refractories: Ceramics, Tiles, Encaustic tiles, Terra-cotta, Earthen ware, Stone ware, Porcelain, Glazing, Clay blocks, Refractories.

Lime: Definition, Classification of binding materials, Sources of lime, Constituents of limestone's, Tests for lime stones, Classification of limes, Comparison between fat lime and hydraulic lime, Manufacture of fat lime, natural and artificial hydraulic lime, Use of lime.

UNIT-II

Cement: Definition, Indian cement industry, Comparison of ordinary cement, Properties of cement, Functions of cement ingredients, Setting action of cement, Site for cement factory, Manufacture of ordinary cement, Packing of cement, Ball mills and tube mills, Field tests for cement, Laboratory tests for cement, Storage of cement, Use of cement, Varieties of cement.

Mortar and Concrete: Definition, Sand, Natural sources of sand, Classification of sand, Bulking of sand, Properties of good sand, Tests for sand, Substitutes for sand, Classification of mortars, Properties of good mortar mix and mortar, Preparations, Uses, Selection of mortar, Tests for mortars. Materials used in C.C. work, Proportioning concrete, Grading of aggregates, Water-cement ratio, Workability, Mixing the materials of concrete, Transporting, placing consolidation of concrete, Curing, Water-proofing cement concrete,

UNIT-III

Timber: Definition, Classification and structure of trees, Defects in timber, Qualities of good timber, Decay, Preservation, Fire-resistance, Seasoning, Conversion, Storage, Market forms of timber, Industrial timber, Advantages and uses of timber, Uses, Indian timber trees, Plantation.

Glass: Classification, Composition, Properties, Types of glass, Manufacture of glass, Treatment of glass, Colored glass, Special varieties of glass, Glass industry in India.

Plastics: Brief history, Composition, Polymerization, Classification of plastics, Resins, Molding compounds, Fabrication, Properties, Uses, PVC, Fiber glass reinforced plastic, High Density Plastics

Paints, Varnishes and Distempers: Painting, Varnishing, Distempering, Wall paper, White washing, Color washing.

Miscellaneous Materials: Abrasives, Adhesives, Asbestos, Asphalt, Cork, Electrical insulators, Fly-ash, Fuels, Gypsum, Gypsum plaster, Heat-insulating materials, Lubricants, Rubber, Sealants for joints, Sheets for pitched roof coverings, Solder, Sound absorbent materials, Tar, Turpentine, Materials used for Acoustical Treatments

UNIT-IV

Ferrous Metals: Iron ores, Selection of iron ores, Pig-iron, Manufacture of Pig-iron, Properties of Pig-iron, Types of Pig-iron, Other methods of pig-iron manufacture, Cast-iron, Casting, Wrought-iron.

Steel: Manufacture of steel, Uses of steel, Factors affecting physical properties of steel, Magnetic properties of steel, Defects in steel, Market forms of steel. Mechanical treatment of steel, Heat treatment processes, Properties of various steel types **Non-Ferrous Metals And Alloys:** Non-ferrous metals, (Aluminum, Cobalt, Copper, Lead, Magnesium, Nickel, Tin, Zinc.), Alloys.

UNIT-V

Failure of Materials: Brittle fracture, ductile fracture, ductile brittle transitions, fatigue failure, creep, corrosion, oxidation

Corrosion: Causes of corrosion, Factors influencing corrosion, Theories of corrosion, Forms of corrosion, Effects of corrosion,

Corrosion of ferrous metals, Standard electrode potential, and Prevention measures for corrosion.

Text Books

1) Rangawala, S.C. *et. al*, "Engineering Materials*",* Charotar Publishing House, Anand, 2002.

2) Duggal, S.K., "Building Materials", New Age International (P) Ltd., Delhi, 2003**.**

3) Gurcharan Singh, "Building Materials", Standard Publishers Distributors, Delhi, 2006.

4) Mackey W.B. and Mackey W.C., "Building Construction",

Reference Books

1) Neville, A.M., "Properties of Concrete", Pitman Publishing, London, 1981.

2) Rajput, R.K., "Engineering Materials*",* S. Chand and Co. Ltd., 2008.

3) Shetty, M.S., "Concrete Technology*",* S. Chand and Co. Ltd., 2008.

4) Ghosh, "Materials of Construction", Tata McGraw Hill Publications, Delhi.

03 Engineering Management

Course Contents

UNIT-I

Evolution of Management Thought

Scientific, human behaviour, system approach, introduction to elements of systems – input, output, process restriction, feedback, contingency approach, contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (theory X and theory Y), H. L. Gantt, Maslow

Functions of Management

Planning – nature and purpose of planning, strategies and policies, management by objectives, formal and informal organization, centralization, decentralization, line, line and staff, functional organization, principles of site layout, leading and directing, controlling and coordination (introduction only), communication process, motivation

UNIT-II

Decision Making

Importance of decision making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monitory value, decision tree, theory of games (dominance pure and mixed strategy).

UNIT-III

Operations Research

Linear programming, simple l-p model, simplex method - duality, sensitivity analysis, application of linear programming in transportation and assignment models

UNIT-IV

Simulation Studies

Monte-Carlo simulation, queuing or waiting line theory (simple problems), dynamic programming, introduction to emerging optimization techniques

UNIT-V

Material Management

Material management – purchasing principles, stores, coding system function, responsibilities, record and accounting. Inventory control – an introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks

Text Books

· Deshpande S. H., “Operation Research”

· Deshpande A. S., “A Text book of Management”

· Gopal Krishnan, “Material Management”, Sdueshan.

· Taha, “Operation Research”

· Banga and Sharma, “Engineering Managnment”

References

· Stoner, “Engineering Management”

· Davar, “Principles of Management”

· Koontz, Dounell and Weigrick, “Essentials of Management”

· Kast and Rosinweig, “Management and Organization”, Tata McGraw Hill Publication.

· Wagner, “Operation Research”, Wikey Easter Ltd., New Delhi

· Zhamb L.C., “Quantitative Techniques in Management”, Vol. I,

· Miller and Stars, “Executive Decisions & Operation Research”, Prentice Hall of India

VI SEMESTER B.E.CIVIL

Course code : 6BCEC01-DESIGN OF STEEL STRUCTURES

Course scheme					**Evaluation scheme (Theory)**				
Lecture	Tutorial	Practical	Periods /week	Credits	Duration of paper hr	MSE	IE	ESE	Total
3	1	3	0	3	3	10	10	80	100

UNITS	TOPIC	HRS.
UNIT I	Steel as a structural material, various grades of structural steel properties, various rolled steel sections (including cold formed sections, structural pipe (tube) sections) and their properties. Introduction to I. S. 800, 808, 816, 875 etc. Design of axially loaded members : (a) Tension members, (b)Compression members Design of roof truss: Load assessment for DL, LL and WL.	10
UNIT II	Design of simple and builtup beams: Laterally restrained and unrestrained, (symmetrical as well as unsymmetrical section).Curtailment of flange plates. Introduction to plastic analysis of simply supported beam, plastic hinges, mechanism shape factors, plastic moments of resistance.	10
UNIT III	Design of welded and rivetted plate girder,design of various stiffners, design of gantry girder. lattice girder.	10
UNIT IV	Design of single rolled steel column section subjected to axial load and uniaxial and biaxial moment Design of axially loaded built up columns. Laced and battened columns for various types of load	7
UNIT V	Structural Fasteners : A. Behaviour of bolted and welded connections (types, Designations, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolted and welded connections. Moment resistant bolted and welded connection. (bending and torsion) B. Design of connection : Beam to beam, beam to column :framed connection. Design of column bases, slab base, gusseted base and grillage foundation base subjected to eccentric loading	5 8

Text Books and Reference Books:-

1. Limit State Design of Steel Structures by S. K. Duggal
2. Limit State Design of Steel Structures by Subramaniun
3. Limit State Design of Steel Structures by B. C. Punmia, A. K. Jain
4. IS 800:2007, Steel tables, IS 875.

Course Code: 6BECE 07: DESIGN OF STEEL STRUCTURES PRACTICAL

Course scheme				Evaluation scheme (LABORATORY)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
		3	2	25	25	50

TERM WORK Minimum two design assignments based on theory syllabus along with the detailed structural drawings on A2 size sheets. Practical Examination shall be based on the above Practical work

6BECE-002 STRUCTURAL ANALYSIS-II

Course scheme					**Evaluation scheme (Theory)**				
Lecture	Tutorial	Practical	Periods /week	Credits	Duration of paper hr	MSE	IE	ESE	Total
3	1	3	0	3	3	10	10	80	100

UNITS	**TOPICS**	**Hrs**
UNIT-I	Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two story).	08
UNIT-II	Moment distribution method applied to sway frames, frame with inclined leg, gable frames. Approximate method Structural analysis for multi-storeyed frames with lateral loads(Portal and Cantilever method), Approximate methods for vertical loads i.e.Substitute frame method etc. (Max three bay three storey).	12
UNIT-III	Column Analogy method, Applications to beams, Calculations of Stiffness factors and carry Over factors for non-prismatic member, Analysis of non-prismatic fixed beams.	06
UNIT-IV	a) Introduction to Flexibility Method of structural analysis,compatibility equations. Hand solution of simple beam problems. Analysis of redundant frames and trusses upto two DOR. b)Moment distribution applied to frames with sway (upto single storey two bay)	12
UNIT-V	Strain energy method applied to simple composite structures (Simple problems),Introduction to basic theory of elasticity, Concept of stress, strains, strain displacement Relationship, equation of equilibrium, boundary conditions, generalized Hooks low, plane Stress and plane strain problems. Theory of photoelasticity applicable to beams. Study of various types of strain gauges, Analyses of strains by strain Guage.	7

TEXT BOOK / REFRENCES

1. THEORY OF STRUCTURE – B.C.PUNMIYA AND A. K. JAIN , LAXMI PUBLICATION

2. THEORY OF STRUCTURE – S. RAMAMRUTHAM , DHANPATHI RAI PUBLICATION

3. THEORY OF ELASTICITY- S.P. TIMOSHANKO AND J.N. GOODIER , McGraw HILL PUBLICATION

4. THEORY OF ELASTICITY – DR. SADHU SINGH , KHANNA PUBLICATION

5. MATRIX METHOD OF STRUCTURAL ANALYSIS- GERE AND WEARER , CBS PUBLICATION.

Course Code: 6BECE008: Structural Analysis II

Course scheme				Evaluation scheme (laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
		3	2	25	25	50

Minimum 10 of the following

Sr.No	Name of Practical
1.	To find the slope and deflection of the continuous beams.
2.	To find the value of flexural rigidity (EI) for a given beam & compare it with theoretical value
3.	To determine the moment required to produce a given rotation at one end of the beam when the other end is (I) pinned (2) fixed.
4.	To study the behavior of different types of struts and to calculate the Euler's buckling load for each case
5.	To verify the Maxwell's reciprocal theorem for beam.
6.	To measure the strain in the cantilever beam with the help of acoustic strain gauge.
7.	Study the various types of strain gauges.
8.	Plotting the influence lines by making use of Muller Breslau principle.
9.	Determination of deflection of trusses by Willot-Mohr's diagram.
10.	Determination of material fringe value.
11.	Determination of stress in beams by photoelastic method
12.	To find horizontal thrust and to draw the influence line for horizontal thrust for two hinged arch .
13.	To calculate horizontal deflection at roller end in two hinged arch.
14.	To measure the strain in the cantilever beam with the help of electrical resistance strain gauge.
15.	To determine horizontal thrust for indeterminate portal frame
16	Study of Polariscope.

6BECE-003 : FLUID MECANICS-II

Course scheme					Evaluation scheme (Theory)				
Lecture	Tutorial	Practical	Periods /week	Credits	Duration of paper hr	MSE	IE	ESE	Total
3	1	3	0	3	3	10	10	80	100

UNITS	TOPICS	Hrs
UNIT-I	**LAMINAR FLOW:** Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen-poiseuille equation. **BOUNDARY LAYER THEORY:** Nominal thickness, displacement thickness, momentum thickness of the Boundary layer: Boundary layer along a long thin its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub layer: Separation of boundary layer on plane and curved surfaces **REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES :** In general definition of drag and lift; flow past plates cylinders and Spheres; drag on sphere, cylinder and flat plate .	10
UNIT-II	**FLOW THROUGH PIPES:** Hydraulically smooth and rough pipes , Frictional resistance to flow of fluid in smooth and rough pepes; Nikurade's experiment; Moody's chart; Darcy-Weisbach & Hazen-william's equation for frictional head loss; Hydraulic gradient ad energy gradient Pipes in series and paralles; Branched pipes; Siphon; transmission of power through pipes; Hardy-cross method of pipe networks; Waterhammer pressure head due to sudden closure of valve.	10
UNIT-III	**FLOW THROUGH OPEN CHANNEL: GENERAL :** Types of channel and their geometrical properties; types of flow in open Channel **UNIFORM FLOW** Chezy's and Manning's equations; Hydrazulically most effcient rectangular , triangular and trapeziodal sections; Computations of normal depth of flow conveyance of channel section factor for uniform flow, normal slope and normal discharge **CRITICAL FLOW** Specific energy and it's diagram; alternate depths; Computations of critical depth, section factor for critical flow critical slope normal critical slope; Specific force and it's diagram; conditions of critical flow. Applications Of Specific Enery. Gradual Transitions Of Channels **GRADUALLY VARIED FLOW** Dyanamic equation for GVF; Classification and characteristics of surface profiles; Direct step method of computing profile length **RAPIDLY VARIED FLOW** Defination of hydraulic jump; Equation of hydraulic jump in horizontal rectangulatr channel; Length & height of jump; Energy loss in jump; Classification of jump.	12
UNIT-IV	**HYDRAULIC MODELS** Difference between model and prototype; Similitude-type of similarities; Model laws-Reynolds model law and Froude model law; types of model distored, undistorted; Froude method of determining resistance to partially submerged objects like ship. **FLUID MACHINERY:** (A) Impact of jet stationary and moving curved vanes. (B) TURBINES: Definition Gross and net heads; different efficiencies; Classification of turbines; component part and working principles; of turbines on the basis of head and specific speed.	08

UNIT-V	**CENTRIFUGAL AND RECIPROCATING PUMPS** (A) **CENTRIFUGAL PUMP:** Component parts; Working principle; Static ad manometric heads; different efficiencies; Specific speed; Theoretical aspects of multistage pump, pump in parallel Priming devices; Trouble & remedies; Main & operating characteristics curves. Selecting on basis of operating characteristics. (B)**RECIPROCATING PUMPS:** Components parts, Working principle, Work done of single & double acting pumps; Negative slip, Air vessels- Working principle and necessity.	10

Text Books: ☐

Hydraulic & Fluid Mechanics- Dr Modi & Dr Seth- Standard book house. ☐

Fluid Mechanics- Streeter & Wylie-McGraw Hill publications. ☐

Fluid Mechanics- Dr. A.K.Jain- Khanna publishers

Reference Books: ☐ Fluid Mechanics through problems- Garde ☐

Theory and applications of Fluid Mechanics- K. Subramanya ☐

Foundation of Fluid Mechanics- Yuan ☐

Flow through open channel- K.G.Rangaraju. ☐

Fluid Mechanics by H. Chaudhary.

Course Code: 6BECE009: Fluid Mechanics- II

Course scheme				Evaluation scheme (LABORATORY)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
-	-	3	2	25	25	50

NAME OF EXPERIMENTS (Minimum 10 Exp.)

1.	Determination of Darcy-Weisbach friction factors for the given pipes.
2.	Determination of Chezy's constant for an open channel.
3.	Development of Specific Energy Diagram for Rectangular Channel.
4.	Study of G.V.F. profile. To determine type of the surface profile and length of the surface profile.
5.	Study of Hydraulic Jump in a horizontal Rectangular Notch.
6.	Study and performance of Francis turbine at constant head.
7.	Study and performance of Pelton Wheel Turbine.
8.	Study and performance of single stage centrifugal pump and draw characteristic curve.
9.	Study and performance of reciprocating pump at a variable speed and find its efficiency.
10	Design problem on pipe network analysis.
11	Study of flow around immersed bodies.

6BECE004 - GEOTECHNICAL ENGINEERING-II

Course scheme					Evaluation scheme (Theory)				
lecture	Tutorial	Practical	Periods /week	Credits	Duration of paper hour	MSE	IE	ESE	Total
2	1	0	0	2	3	10	10	80	100

UNITS	TOPICS	Hrs
Unit-I :	**GEOTECHNICAL EXPLORATION:** Importance and objectives of field exploration, principal methods of Subsurface exploration, open pits & shafts, types of boring, number, location and Depth of boring for different structures, type of soil samples & samplers. Principles of design of samplers, collection & shipment of samples, boring and sampling record. Standard penetration test, corrections to N-Values & correlation for obtaining design soil parameters. **GROUND IMPROVEMENT:** Method of soil stabilization use of admixtures (lime, cement, flash) in stabilization. Basic of reinforced earth, use of geosynthetic materials Salient features, Function and applications of various geosynthetic matarials. vibroflotation, sand drain Installation.pre-loading.	10
Unit-II:	**STABILITY OF SLOPES:** Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, □ centerof critical slip circle, slices method for homogeneous c-□ soil slopes with pore pressure consideration. Taylor's stability numbers & stability-charts, method of improving stability of slopes, types, NT plot method , friction circle method.	08
Unit-III:	**LATERAL EARTH PRESSURE:** Earth pressure at rest, active & passive pressure, General & local states of plastic equilibrium in soil. Rankine's and Couomb's theories for earth pressure. Effects of surcharge, submergence. Rebhann's criteria for active earth pressure. Graphical construction by Poncelet and Culman for simple cases of wall-soil systems for active pressure condition , tensile cracks effect.	10
UNIT-IV:	**SHALLOW FOUNDATIONS:** Bearing capacity of soils: Terzaghi"s theory,its validity and limitations,Bearing capacity factors types of shear failure in foundation soil, effect of waterTable on bearing capacity, correction factors for shape and depth of footing. Bearing capacity estimation from N-value, factors for affecting bearing capacity presumptive bearing capacity. Settlement of shallow foundation: causes of excessive settlement elastic and consolidation Settlement, differential settlement, control of excessive settlement proportioning The footing for equal settlement. Plate load test procedure, interpretation for Bearing capacity and settlement prediction. limmitation and plate load test.	12
UNIT- V	**PILE FOUNDATION**: Classification of piles, constructional features of cast-in-situ and pre cast Concrete piles. Pile driving methods effect of pile driving on ground Load Transfer mechanism of axially loaded piles. Pile capacity by static formula & Dynamic formula, pile load test and interpretation of data group action in piles, Spacing of piles in groups, group efficiency, overlapping of stresses. Settlement of pile group by simple approach, negative skin friction and its effect on pile capacity general feature of under reamed piles.	10

REFERENCES:-

GEOTECHNICAL ENGINEERING –P. Purshottam Raj, Tata MacGraw Hill

GEOTECHNICAL ENGINEERING – Arora

GEOTECHNICAL ENGINEERING – B.C.Punmia

Course Code: 6BECE005: Computer Application in Civil Engineering

Course scheme			Duration of paper			Evaluation scheme(Theory)		
Lecture	Tutorial	Practical	Credits	MSE		IE	ESE	Total
3	1	-	2	3 Hr	10	10	80	100

UNITS	TOPICS	Hrs
Unit I:	C-Fundamentals, CHARACTER SET, Data types constants and variables, Operators and Expressions, Library functions, Data input and output, Interactive programming preparing and running a complete simple programme.	10
Unit II:	Control statements, while and do-while statement, for and nested for statement, conditional statements such as if, if-else, switch, comma operator and program preparing using all such statements	10
Unit III:	Fuctions, different types of functions, storage class, Arrays (one dimensional and two dimensional) and interactive computer program development, pointers, structures and unions, file handling in C.	08
Unit IV:	Fudamentals of Numerical methods, Interpolation and Extrapolation.Numerical Integration techniques (Simpson's method, Trapezoidal method, Newton Gauss quadrature method), Interactive Computer Program Development. Linear algebraic equation solution techniques, Interactive Computer Program Development.	12
Unit V:	Initial & two point boundary value problems,Eulers method, Runga- Kutta, Milnes method and Interactive Computer program development. Solution of non linear equations (Newton Raphon schemes) and Interactive Computer program development	10

Textbook/References:

1. Let Us C- Yashwant Kanetkar- BPB Publications.
2. Programming with C- Byron Gottfried- McGraw Hill Professional.
3. Numerical Methods- E Balaguruswamy-Tata McGraw-Hill Publishing Company Limited.
4. Numerical methods for Engineers- Santosh K Gupta- New Age International Publication.

(**Note:** Minimum two questions will be set from each unit for University examination paper)

Course Code: 6BECE010: Computer Application in Civil Engineering

Course scheme				Evaluation scheme(Laboratory)		
Lecture	**Tutorial**	**Practical**	**Credits**	**TW**	**POE**	**Total**
-	**-**	**3**	**2**	**25**	**25**	**50**

I. Total 12 programmes with output using C language, having application in following Civil Engg subjects (Minimum one programme on each subject).
Engg Mechanics, SOM, Hydraulics, Water resources Engg, Surveying, Design of RCC Structures, Design of steel structures, Fluid Mechanics, Estimating and Costing, Irrigation Engg, Environmental Engg, Transportation Engineering.
II. Minimum 04 (Four) programmes with output using C language on Numerical methods.

III. One assignment on DATABASE MANAGEMENT SYSTEM for any one complete Civil Engg Projects.

6BECE006 PROGRAMME ELECTIVE – II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	2	3	10	10	80	100

01 Operation Research
02 Advanced Engineering Geology
03 Engineering Economics

01 Operation Research

Course Contents

UNIT-I

Introduction to Operations Research

Introduction, Use of Operations Research in Civil Engineering and Managerial Decision making process, Structure of the Mathematical Model, Limitations of Operations Research, Identification of civil engineering systems and their methods of analysis, Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction, Multivariable optimization with and without constraints, Objective function and constraints

UNIT-II

Linear Programming

Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, duality, Sensitivity Analysis, Civil engineering applications.

UNIT-III

Transportation Problem

Formulation, solution, finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method (Introductory Treatment only).

UNIT-IV

Integer, Dynamic and Non-Linear programming

Integer programming Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique

Dynamic programming Multi stage decision processes, Principle of optimality, Recursive equation, Application of D.P., Introduction to Non-Linear programming: Single variable unconstrained optimization –Local & Global optima, Uni-modal Function- Sequential Search Techniques

UNIT-V

Simulation

Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte- Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of

Simulation.

Queuing Theory and Game Theory

Queuing Theory, Simulation, Sequencing model, Competitive games, rectangular game, saddle point, minimax, maximin method of optimal strategies, value of the game. Solution of games with saddle points,

References:

· Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002.

· Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009.

· Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002.

· S. D. Sharma, Operations Research, KedarNath Ram Nath-Meerut.

· KantiSwarup, P. K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons

02 Advanced Engineering Geology

Course Contents

UNIT-I

Stratigraphy and Indian geology: geological time scale, physiographic divisions of India and their geological, geomorphologic and tectonic characteristics, study of important geological formations of India namely: Vindhyan, Gondwana, and Deccan traps with respect to: distribution, lithology, tectonics, economic importance etc. significance of these studies in civil engineering

UNIT-II

Sub-surface exploration: Steps in geological studies of project site, engineering consideration of structural features, exploratory drilling, preservation of cores, core logging, graphical representation of core log, limitations of exploratory drilling method, numerical problems on core drilling, introduction to geological map

Sub-surface water: Runoff, fly off and percolation of surface water, juvenile, connate and meteoric water, water table, zones of subsurface water, perched water table, aquifer theory

UNIT-III

Engineering geology of Deccan traps: Types of basalts and associated volcanic rocks, engineering characteristics, infillings of gas cavities, compact and amygdaloidal basalt as construction material, effect of jointing, hydrothermal alteration and weathering on engineering behaviour, tail channel erosion problem in Deccan trap region, suitability for tunnelling, problems due to columnar basalt, dykes, red bole, tachylitic basalt, volcanic breccias and fractures, laterites: origin, occurrence and engineering aspects, ground water bearing capacity of rocks of Deccan trap region, percolation tanks

UNIT-IV

Geology of soil formations: Soil genesis, geological classification of soils, residual and transported soils, soil components, characteristics of soils derived from different types of rocks, nature of alluvium and sand from rivers of Deccan trap region, scarcity of sand

UNIT-V

Geophysics: Various methods: magnetic, gravitational and electrical resistivity methods, applications of electrical resistivity method using Wennerconfiguration in civil engineering problems such as: finding thickness of over burden and depth of hard rock, locating the spot for ground water well, seepage of water finding,

Rock mechanics: General principles, engineering properties of rocks and their dependence upon geological characters, in-built stresses in rocks, measurements of these stresses

Plate tectonics, seismic zones of world, seismic activity of Deccan trap region, various theories on the origin of the seismic activity of Deccan trap region, prediction of earthquake, earthquake resistant constructions, numerical problems based on seismic data, cause and prediction and preventive measurement of landslide in Deccan trap region.

Text Books

· Gupte R. B., "A Text Book of Engineering Geology", Pune VidyarthiGrihaPrakashan, Pune.

· Gokhale K.V.G.K. and Rao D. M., "Experiments in Engineering Geology", TMN, New-Delhi.

· Mukerjee P. K., "A Text Book of Geology", The World Press Pvt. Ltd., Calcutta.

· Prabin Singh, "Engineering and General Geology", S. K. Katariya and sons, Delhi.

Reference Books

· Tyrrell G. W., "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi.

· Holmes A., "Principles of Physical Geology", ELBS Chapman &Hall,London.

· Billings M. P., "Structural Geology", Prentice Hall of India Private Ltd., New Delhi.

· Farmer L. W., "Engineering Properties of Rocks", Champman& Hall, London.

· Reddy, "Engineering Geology for Civil Engineering", Oxfard& IBH Publishing Co. N. Delhi.

· SathyaNarayanswamiB. S., "Engineering Geology", DhanpatRai& Co.(P) Ltd, Delhi

03 Economics for Engineers

UNIT-I

Economic Decisions Making – Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

UNIT-II

Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest. 4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

UNIT-III

Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. 6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. 7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

UNIT-IV

Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.

UNIT V

Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.

Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.