

J. S. UNIVERSITY, SHIKOHABAD



B. TECH
2ND , 3RD & 4TH YEAR
(CIVIL ENGINEERING)

SCHEME
&
SYLLABUS

[Effective from the session 2015-16 onward]

**STUDY AND EVALUATION SCHEME FOR
B.Tech (Civil Engineering).**

SEMESTER - III

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme				
			L	T	P	D	Sessional	End Exam	Total	Duration	
THEORY SUBJECT											
1	BTAS-31	Engg Mathematics-III	4	1	-	-	50	100	150	3	
2	BTCE-31	Fluid Mechanics	4	1	-	-	50	100	150	3	
3	BTME-31	Mechanics of Solids	4	1	-	-	50	100	150	3	
4	BTCE-32	Building Materials & Construction	4	1	-	-	50	100	150	3	
5	BTCE-33	Surveying – I	4	1	-	-	25	50	75	2	
6	BTIP-31	Industrial Psychology	4	1	-	-	25	50	75	2	
7	BTAC-31	Human Value & Professional Ethics*	2	-	-	-	25	50	75	2	
PRACTICA/DRAWING SUBJECTS											
8	BTCE-31P	Fluid Mechanics Lab.	-	-	2	-	20	30	50	3	
9	BTCE-32P	Buildg. Materials Lab	-	-	2	-	20	30	50	3	
10	BTCE-34P	Building Planning & Drawing	-	-	2	-	20	30	50	3	
11	BTCE-33P	Surveying-I Lab	-	-	2	-	20	30	50	3	
12	BTGD-30	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
									Grand Total	1000	

*Human values & Professional Ethics will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NOTE:- (1) Each period will be 50 minutes duration.

(2) Each session will be of 16 weeks.

(3) Effective teaching will be at least 14 weeks.

(4) Remaining periods will be utilised for revision etc.

**STUDY AND EVALUATION SCHEME FOR
B.Tech (Civil Engineering).**

SEMESTER - IV

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme				
			L	T	P	D	Sessional	End Exam	Total	Duration	
THEORY SUBJECT											
1	BTOE-41- BTOE-49	Science Based Open Elective	4	1	-	-	50	100	150	3	
2	BTCE-41	Structural Analysis -I	4	1	-	-	50	100	150	3	
3	BTCE-42	Geoinformatics	4	1	-	-	50	100	150	3	
4	BTCE-43	Hydraulics & Hydraulic Machines	4	1	-	-	50	100	150	3	
5	BTCE-44	Engineering Geology	4	1	-	-	25	50	75	2	
6	BTIS-41	Industrial Sociology	4	1	-	-	25	50	75	2	
7	BTAC-41	Cyber Security*	2	-	-	-	25	50	75	2	
PRACTICA/DRAWING SUBJECTS											
8	BTCE-41P	Structural Analysis Lab.	-	-	2	-	20	30	50	3	
9	BTCE-42P	Geoinformatics Lab	-	-	2	-	20	30	50	3	
10	BTCE-43P	Hydraulics & MachineLab.	-	-	2	-	20	30	50	3	
11	BTCE-45P	CBSNT Lab	-	-	2	-	20	30	50	3	
12	BTGD-40	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
Grand Total									1000		

*Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

List of Open Electives for B. Tech. Courses

SCIENCE BASED OPEN ELECTIVE

BTOE-041	Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm)
BTOE-042	Nano Sciences
BTOE-043	Laser Systems and Applications
BTOE-044	Space Sciences
BTOE-045	Polymer Science & Technology
BTOE-046	Nuclear Science
BTOE-047	Material Science
BTOE-048	Discrete Mathematics
BTOE-049	Applied Linear Algebra

**STUDY AND EVALUATION SCHEME FOR
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SEMESTER - V

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	BTCE-51	Geotechnical Engineering	4	1	-	-	50	100	150	3
2	BTCE-52	Transportation Engineering-I	4	1	-	-	50	100	150	3
3	BTCE-53	Environmental Engg.- I	4	1	-	-	25	50	75	2
4	BTCE-54	Structural Analysis-II	4	1	-	-	50	100	150	3
5	BTCE-55	Design Of Concrete Structure-1	4	1	-	-	50	100	150	3
6	BTMB-51	Engg.Economics	4	1	-	-	25	50	75	2

PRACTICA/DRAWING SUBJECTS

8	BTCE-51P	Geotechnical Engineering Lab	-	-	2	-	20	30	50	3	
9	BTCE-52P	Transportation Engineering Lab	-	-	2	-	20	30	50	3	
10	BTCE-53P	CAD Lab	-	-	2	-	20	30	50	3	
11	BTCE-54P	Estimation Costing And Valuation	-	-	2	-	20	30	50	3	
12	BTGD-50	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
Grand Total									1000		

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**STUDY AND EVALUATION SCHEME FOR
B.Tech (Civil Engineering).**

SEMESTER - VI

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	BTCE-61	Design of Concrete structure-II	4	1	-	-	50	100	150	3
2	BTCE-62	Environmental Engineering-II	4	1	-	-	50	100	150	3
3	BTCE-63	Construction Technology And Management	4	1	-	-	50	100	150	3
4	BTCE-64	Environmental Management For industries	4	1	-	-	50	100	150	3
5	BTCE-65	Rural Water supply And Sanitation	4	1	-	-	25	50	75	2
6	BTMB-61	Industrial Management	4	1	-	-	25	50	75	2

PRACTICA/DRAWING SUBJECTS

8	BTCE-61P	Structural Detailing Lab	-	-	2	-	20	30	50	3	
9	BTCE-62P	Environmental Engineering Lab	-	-	2	-	20	30	50	3	
10	BTCE-63P	Cad Lab –II	-	-	2	-	20	30	50	3	
11	BTCE-64P	Survey camp	-	-	2	-	50	-	50	3	
12	BTGD-40	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
Grand Total									1000		

NOTE:- (1) Each period will be 50 minutes duration.

(2) Each session will be of 16 weeks.

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**STUDY AND EVALUATION SCHEME FOR
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SEMESTER - VII

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme				
			L	T	P	D	Sessional	End Exam	Total	Duration	
THEORY SUBJECT											
1	BTCE-71	Design of Steel Structure	4	1	-	-	50	100	150	3	
2	BTCE-72	Water Resource Engineering	4	1	-	-	50	100	150	3	
3	BTCE-73	Engineering Hydrology	4	1	-	-	50	100	150	3	
4	BTCE-74	Tunnel Engineering	4	1	-	-	50	100	150	3	
5	BTOE-71	Quality management	4	1	-	-	50	100	150	2	
PRACTICA/DRAWING SUBJECTS											
6	BTCE-71P	Seminar	-	-	1	-	50	-	50	3	
7	BTCE-72P	Industrial Training	-	-	2	-	50	-	50	3	
8	BTCE-73P	Project	-	-	2	-	100	-	100	3	
9	BTGD-70	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
									Grand Total	1000	

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(3) Effective teaching will be at least 14 weeks.

(4) Remaining periods will be utilized for revision etc.

**STUDY AND EVALUATION SCHEME FOR
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SEMESTER - VIII

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme				
			L	T	P	D	Sessional	End Exam	Total	Duration	
THEORY SUBJECT											
1	BTOE-81	Non Convention Energy Resources	4	1	-	-	50	100	150	3	
2	BTCE-81	Transportation Engineering-II	4	1	-	-	50	100	150	3	
3	BTCE-82	Water resources systems	4	1	-	-	50	100	150	3	
4	BTCE-83	River Engineering	4	1	-	-	50	100	150	3	
PRACTICA/DRAWING SUBJECTS											
5	BTCE-81P	Project	-	-	2	-	100	250	350	3	
6	BTGD-80	Games//Social and Cultural Activities + Discipline (25 + 25)							50		
Grand Total									1000		

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[BTAS-31] Engg. Mathematics-III

Unit – I: Function of Complex variable

Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type

Unit – II: Integral Transforms

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations Z- transform and its application to solve difference equations.

Unit – III: Statistical Techniques

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non-linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests of significations: Chi-square test, t-test

Unit – IV: Numerical Techniques – I

Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit – V: Numerical Techniques – II

Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss-Seidal method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eighth rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge-Kutta methods.

Test Books:-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House,.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.

[BTCE-31] Fluid Mechanics

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and nonuniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley & Sons Pvt Ltd,
2. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.

BTME-31] Mechanics of Solids

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclined sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hooke's law, theories of failure.

UNIT –II

Stresses in Beams: Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Rankine Gordon formulae, examples of columns in mechanical equipments and machines.

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

Thick cylinders:

Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by Beer, Johnston, Dewolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and Youngs, East West Press.

[BTCE-32] Building Materials & Construction

Unit-1

Classification of building materials: building materials and their performance, economics of the building materials.

Stones, Requirement of good building stone, characteristics of building stones and their testing. Common building stones. Methods of preservation of stones.

Bricks: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles.

Gypsum: properties of gypsum plaster, building products made of gypsum and their uses.

Lime: Manufacture of lime, classifications of limes, properties of lime.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements

for uses, Natural and Artificial flyash, Surkhi (burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction.

Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factors affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products.

Asphalt, Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

Unit – II

Chemistry of Plastics manufacturing process, classification, advantages of plastics, Mechanical properties and use of plastic in construction.

Paints varnishes and distempers, Common constituents, types and desirable properties, Cement paints.

Ferrous metals, Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcing steel mechanical and physical Properties chemical composition. Brief discussion on properties and uses of Aluminum and lead.

Glass: Ingredients, properties and uses in construction.

Insulating Materials: Thermal and sound insulating material, desirable properties and types of insulating materials.

Unit – III

Component of building, area considerations, Construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, Vertical circulation means: staircases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonry construction. Cavity wall hollow block construction.

Unit- IV

Doors, Windows and Ventilations, Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintels and Chhajja, Function and efficiency of Buildings.

Unit-V

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electricity. Heating Ventilation & Air conditioning, Mechanical Lifts and Escalators, Fire Fighting, Acoustics. Plastering different types, pointing, Distemping, Colour washing, Painting etc. Principles & Methods of building maintenance

References

1. SK Duggal: Building Materials, New Age International
2. P.C. Varghese: Building Materials, PHI

[BTCE-33] Surveying – I

Unit - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors.

Linear Measurements, Measurement of directions: Reference meridians, bearing and azimuths, Compass, Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control, Electronic Theodolites and Total Station.

Unit – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, Automatic level, Digital Level, Vertical Control.

Contouring: methods and uses, Principles of stadia systems, subtense bar and tangential methods.

Unit – III

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, triangulation field work.

Plane table surveying, equipments, methods, resection by three point problem.

Unit – IV

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves.

References

1. B. C. Punamia et al: Surveying Vol. I, II
2. A. M. Chandra: Plane Surveying, Higher Surveying

[BTCE-31P] Fluid Mechanics Lab

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the coefficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the coefficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

[BTCE-32P] Buildg. Materials Lab

Testing of various properties of following as per BIS specifications

I.Cement

- 1.Normal Consistency of cement.
- 2.Initial& final setting time of cement
- 3.Compressive strength of cement
- 4.Finenessofcementbyair permeability and Le-chatalier's apparatus.
- 5.Soundness of cement.
- 6.Tensilestrength

II.Coarse Aggregate

- 1.Crushing value of aggregate
- 2.Impactvalue of aggregate
- 3.water absorption of aggregate
- 4.SieveAnalysis of Aggregate
- 5.Specific gravity &bulk density
- 6.Grading of aggregates.

III FineAggregate:

- 1.Sieveanalysisofsand
- 2.Silt content of sand
- 3.Bulkingofsand

IV **Cement concrete:** Workability tests, compressive strength, Tensile strength

V **Reinforcing Steel :**Tensile and yield strength, Percentage elongation

VI **Non destructive testing on concrete**

VII Bricks:

- 1.Waterabsorption.
- 2.Dimension Tolerances
- 1Compressive strength
- 4.Efflorescence

[BTCE-34P] Building Planning & Drawing

Drafting of following Using Any CAD software

- 1.Symbols used in Civil Engineering drawing , Types of Masonry Bonds
- 2.Doors, Windows and staircases.
- 3.Plumbing& Electrical fitting drawings
- 4.Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation& sectional elevation) elevation, plumbing & electrical fillings in out.
- 5.Preparation of Layout plans of different types of Civil Engg. Projects.Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.

[BTCE-33P] Surveying-I Lab

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical levelling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method

[BTIP-31] Industrial Psychology

Unit-I

Introduction to Industrial Psychology – Definitions & Scope. Major influences on industrial Psychology- Scientific management and human relations schools Hawthorne Experiments

Unit-II

Individual in Workplace Motivation and Job satisfaction , stress management. Organizational culture, Leadership & group dynamics.

Unit-III

Work Environment & Engineering Psychology-fatigue. Boredom, accidents and safety. Job Analysis, Recruitment and Selection – Reliability & Validity of recruitment tests.

Unit –IV

Performance Management : Training & Development.

References :

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition) Wadsworth/Thompson : Belmont, C.A
- . 4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill

[BTAC-31] Human Value & Professional Ethics

Module-1

Course introduction, Needs Basic guidelines

- 1 Understand the need , basic , guidelines content for process value education.
2. Self Exploration what is it? It content and process, Natural Acceptance and experiential Validation as the mechanism for self exploration.
- 3 Continues happiness and Prosperity- A look at continues human Aspiration.
- 4 Understanding Happiness and Prosperity correctly- A critical appraisal of the current senerio.
- 5 Method to fulfilled the human aspiration

Module -2

Understanding Harmony in human Being (Harmony in Myself)

1. Understanding Harmony as a co – existence of the sentient I and the Material Body.
2. Understanding the need of self (I) and body sukh and suvidha.
3. Understanding the body of an instrument of I (being Doar, seer and enjoyer.
4. Understanding the Charactersticks and activities of (I)

Module -3

Understanding harmony in the Family and Society

1. Understanding harmony in the Family and basic unit of Human interaction.
2. Understanding values in human – Human relationship meaning of nayaya and program for the fulfillment of ensure abhay and tripti.
3. Understanding the meaning of Vishvas difference between intension and competence.
4. Understanding the Harmony in the society (society being an Extension of family - samadhan , Samriddi , Abhay,sahastitva and comprehension of Human goals.

Module -4

Understanding the harmony in the Nature and existence – whole Existence as Co- existence.

- 1 Understanding the harmony in the Nature.
- 2 Interconnectedness and mutual fulfillment among the four order of Nature –recyclability ,andself regulation in nature.
- 3 Holistic prception of Harmony at all levels of existence.

Module – 5

Implication of the above Holistic understanding of Harmony on professional ethics.

- 1 Natural acceptance of human values.
- 2 Deffinateness of ethical human conduct.
- 3 Basic for humanistic education. Humanstick constitution and human universal order.
- 4 Case studies of typical holistic technologies , Management model and Production system.
- 5 Strategy for transition from the presnt stage of universal order.
A - At the level of individual : as socially and ecologically responsible engineers technologist and manager.
B- At the Level of Society as mutually enriching institution and organisations

BTCE-41 STRUCTURAL ANALYSIS-I

Unit-I :

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom per node, Static and Kinematic Indeterminacy for beams, trusses and building frames. Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.

Unit- II

Rolling loads and influence line diagrams for beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principle & its applications for determinate structures

Unit - III

Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged parabolic arch, spandrel braced arch, moving load & influence lines for three hinged arch.

Unit - IV

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, Calculations of deflections: Moment area method, unit load method & Conjugate beam methods for statically determinate beams, truss and frames.

Unit-V

Unsymmetrical bending in beams, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural sections. Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.

References

1. Hibbler, "Structural Analysis", Pearson Education
2. T. S. Thandavmorthy, "Analysis of Structures", Oxford University Press
3. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
5. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures". Vol. I & II Nem Chand.
6. Vazirani & Ratwani et al, "Analysis of Structures", Khanna Publishers
7. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.

BTCE- 42 GEOINFORMATICS

Unit - I

Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation, Introduction to Digital Photogrammetry.

Unit - II

Remote Sensing: Physics of remote sensing, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC

Unit - III

Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing

Unit - IV

Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications

Unit – V

Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Higher Surveying
3. T M Lillesand et al: Remote Sensing & Image Interpretation
4. B. Bhatta: Remote Sensing & GIS
5. M Anjireddy : Remote Sensing & GIS , BS Publications
6. A. E Rabbany: Introduction to GPS
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad.

[BTCE- 43] Hydraulics & Hydraulic Machines

Unit - I

Difference between open channel flow and pipe flow, geometrical parameters of a channel.

Continuity equation for steady and unsteady flow. Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit – II

Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.

Unit - III

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.

Unit - IV

Classical hydraulic jump, Evaluation of the jump elements in rectangular and nonrectangular channels on horizontal and sloping beds. Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.

Unit - V

Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall. Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References :

1. Chow, V.T. "Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

BTCE-44 ENGINEERING GEOLOGY

UNIT I – Study of Rocks

Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties.

UNIT II- Study of Minerals

Physical properties of minerals. Detailed study of certain rock forming minerals. Alkali aggregate reaction. Grouting. Pozzolonic materials.

UNIT III- Rock Deformation & Earthquake

Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration.

UNIT IV- Geophysical Exploration and Geological Investigation

Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway.

References:

1. D Venkat Reddy: Engg. Geology, Vikas Publication
2. Tony Waltham: Foundations of Engg. Geology, Spon Press
3. Tony Waltham: Foundations of Engineering Geology, SPON Press.
4. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
5. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
6. K V G K Gokhale: Text book of Engineering Geology, B S Publication.
7. Prabin Singh: Engg. and General Geology, Katson Publishing House.
8. D S Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
9. F G Bell: Fundamental of Engineering Geology, B S Publication.
10. Leggot R F: Geology and Engineering, McGraw Hill, New York.
11. P K Mukerjee: A Text book of Geology, Calcuta Word Publishers.
12. B S Sathya Narayanswami: Engineering Geology, Dhanpat Rai & Co.
13. Prakash Rao : Engineering Geology, Nirali Prakashan, Pune.

BTCE-41P STRUCTURAL ANALYSIS LAB

Following experiments to be performed

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell's Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

[BTCE- 42P] GEOINFORMATICS LAB

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

[BTCE -43P] Hydraulics & Hydraulic Machines LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc

[BTCE- 45P] COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regulafalsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
2. To implement Newton's Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
4. To implement Numerical Differentiations & Integration
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness
7. Linear correlation and regression

[BTIS-41] Industrial Sociology

Unit-I Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organization in Industry- Bureaucracy, Scientific Management and Human Relations.

Unit-II Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

Unit-III Industrialization in India: Industrial Policy Resolutions – 1956.Science.Technology and Innovation Policy of India 2013.

Unit-IV Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals.

References :

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.

[BTAC-41] Cyber Security

UNIT-1

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, eCash,Credit/Debit Cards. Digital Signature, public KeyCryptography.

UNIT-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control,CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT-4

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, PolicyReview Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement ofthe Policies.Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; ITAct 2000 Provisions,Intellectual Property Law: Copy Right Law, Software License, Semiconductor Lawand Patent Law.

References :

1. Charles P. Pfleeger, Shari LawerancePfleeger, "Analysing Computer Security ", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
- 3.Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.

SCIENCE BASED OPEN ELECTIVES
[BTOE-41] INTRODUCTION TO SOFT COMPUTING
(Neural Networks, Fuzzy Logic and Genetic Algorithm)

Unit-I : Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.

Unit-II : Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back opogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III : Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV : Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications&Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V : Genetic Algorithm(GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

Text Books:

1. S. Rajsekaran& G.A. VijayalakshmiPai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.
2. N.P.Padhy,”Artificial Intelligence and Intelligent Systems” Oxford University Press.

Reference Books:

3. SimanHaykin,”Neural Netowrks”Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

[BTOE-42] NANO SCIENCES

UNIT -1 :

Introduction:

Definition of Nano-Science and Nano Technology, Applications of Nano-Technology.

Introduction to Physics of Solid State:

Structure: Size dependence of properties; crystal structures, face centered cubic nanoparticles; Tetrahedrally bounded semiconductor structures; lattice vibrations.

Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.

Localized Particles: Acceptors and deep traps; mobility; Excitons.

UNIT-2

Quantum Theory For Nano Science:

Time dependent and time independent Schrodinger wave equations. Particle in a box, Potential step: Reflection and tunneling(Quantum leak). Penetration of Barrier, Potential box(Trapped particle in 3D:Nanodot), Electron trapped in 2D plane(Nano sheet), Quantum confinement effect in nano materials.

Quantum Wells, Wires and Dots

Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity.

Properties of Individual Nano particles

Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanoparticles; geometric structure; electronic structure; Reactivity; Fluctuations Magnetic Clusters; Bullets to Nano structure.

Semi conducting Nanoparticles: Optical Properties; Photofragmentation; Coulombic explosion.

Rare Gas & Molecular Clusters: Inert gas clusters; Superfluid clusters molecular clusters.

UNIT-3

Growth Techniques of Nanomaterials:

Lithographic and Nonlithographic techniques, Sputtering and film deposition in glow discharge, DC sputtering technique(p-CuAlO₂ deposition). Thermal evaporation technique, E-beam evaporation, Chemical Vapour deposition(CVD), Synthesis of carbon nano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beam Epitaxy, Sol-Gel Technique (No chemistry required), Synthesis of nanowires/rods, Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid-Solid (VLS) method of nanowires.

UNIT -4

Methods of Measuring Properties:

Structure: Crystallography, particle size determination, surface structure,

Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy (TEM)

Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

UNIT-5

Bucky Ball:

Nano structures of carbon(fullerene):

Carbon nano-tubes: Fabrication, structure. electrical, mechanical, and vibrational properties and applications. Nano diamond, Boron Nitride Nano-tubes, single electron transistors, Molecular machine, Nano-Biometrics, Nano Robots.

Text/Reference Books:

1. C.P.Poole Jr F.J. Owens, "Introduction to Nanotechnology".
2. "Introduction to S.S. Physics" - (7th Edn.) Wiley 1996.

[BTOE-43] LASER SYSTEMS AND APPLICATIONS

UNIT-I & II

Introduction:

Review of elementary quantum physics, Schrodinger equation, concept of coherence, absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities.

UNIT-III & IV

Lasers & Laser Systems:

Main components of Laser, principle of Laser action, introduction to general lasers and their types. Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.

UNIT-V

Applications:

Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography.

Text/ Reference Books:

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S. A. Ahmad, "Laser concepts and Applications" New Age Internati

[BTOE-44] SPACE SCIENCES

1. Introduction:

Introduction to space science and applications, historical development

2. Solar System:

Nebular theory of formation of our Solar System. Solar wind and nuclear reaction as the source of energy.

Sun and Planets: Brief description about shape size, period of rotation about axis and period of revolution, distance of planets from sun, Bode's law, Kepler's Laws of planetary motion, Newton's deductions from Kepler's Laws, Newton's Law of gravitation, correction of Kepler's third law, determination of mass of earth, determination of mass of planets with respect to earth. Brief description of Asteroids, Satellites and Comets.

3. Stars:

Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation of elements.

Classification of stars: Harvard classification system, Hertzsprung-Russel diagram,

Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit.

4. Galaxies:

Galaxies and their evolution and origin, active galaxies and quasars.

5. Creation of Universe:

Early history of the universe, Big-Bang and Hubble expansion model of the universe, cosmic microwave background radiation, dark matter and dark energy.

Text Books / Reference Books:

1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.
2. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International.

[BTOE-45] POLYMER SCIENCE AND TECHNOLOGY

UNIT –I & II

POLYMERS:

Introduction, chemistry of polymer synthesis, polymer reaction kinetics, physical properties and characterization of polymers, effect of structure on properties of polymers, organic polymers. Introduction to high performance polymers and composites and their processing.

UNIT –III & IV

POLYMERIZATION:

Introduction, step-growth polymerization, free radical chain growth polymerization, emulsion polymerization, ionic and cationic polymerization, chain statistics and rubber elasticity.

UNIT – UNIT –V & VI

PREPARATION AND APPLICATIONS:

Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats (PF, UF) and elastomers (SBR, GR-N), silicones. Application of polymers in space, ocean, electronics, medical, agriculture, automobile, sports and building construction.

[BTOE-46] NUCLEAR SCIENCE

UNIT-I

Nucleus and Its Basic Features:

Nuclear structure; nuclear forces and their properties, nuclear stability, nuclear radius and its measurement, nuclear spin, nuclear magnetic and electrical moments.

UNIT-II

Nuclear Models:

Single particle model, liquid drop model and semi-empirical mass formula, nuclear potential and shell model, collective model.

UNIT-III

Nuclear Reaction:

Nuclear reaction and laws of conservation, types of nuclear reaction, mechanism of nuclear reaction, nuclear fission & binuclear fusion and their explanation by liquid drop model.

UNIT-IV

Nuclear Decay:

Decay constant, half life period and mean life, alpha decay, beta decay, gamma decay, interaction of nuclear radiation with matter.

Nuclear Instruments-I

Mass spectrograph,: General principle, Aston's Mass Spectrograph.

UNIT-V

Nuclear Instruments-II

Accelerators: Van de Graph Generator, Cyclotron, Synchrotron.

Detectors: G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production and detection of neutrons and Gamma-photon.

Application of Nuclear Techniques: Nuclear magnetic resonance, positron emission topography, radiotracer techniques and applications in material science and agriculture.

Text Books:

1. Tayal, "Nuclear Physics" Himalaya Publishing House.
2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.

Reference Books:

6. Roy & Nigam, "Nuclear Physics" John Wiley & sons.
7. W.E. Burcham, "Nuclear Physics" Longmans Publications.

[BTOE-47] MATERIAL SCIENCE

UNIT-I

Introduction: Historical perspective, importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding.

Crystallography and imperfections:

Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques, imperfections, Defects & Dislocations in solids.

UNIT-II

Mechanical Properties and Testing: Stress strain diagram, Ductile and brittle materials, stress Vs strength, toughness, hardness, fracture, fatigue and creep. Testing, such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT)

Micro Structural Exam: Microscope principle and methods, Preparation of samples and microstructure exam and grain size determination, comparative study of microstructure of various metals and alloys, such as Mild steel, CI, Brass.

Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules, Types of equilibrium diagrams: solid solution type, eutectic type and combination type, Iron-carbon equilibrium diagram.

UNIT-III

Ferrous materials: Iron and steel manufacture, furnaces, various types of carbon steels, alloy steels and cast irons, its properties and uses.

Heat Treatment: various types of heat treatment, such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams.

Non-Ferrous metals and alloys: Non-ferrous metals, such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various types of Brass, Bronze bearing materials their properties and uses. Aluminum alloys, such as Duralumin, Other advanced materials/alloys.

UNIT-IV

Magnetic properties: Concept of magnetism- Dia, para, ferro magnetic materials, Hysteresis, Soft and hard magnetic materials, Magnetic Storages.

Electric Properties: Energy band, concept of conductor, insulator and semi conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors, Basic devices and their applications. Diffusion of Solid Super conductivity and its applications, Meissner effect. Type I & II superconductors. High Temp. superconductors.

UNIT-V

Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behaviour and processing of ceramics.

Plastics: Various types of polymers/plastics and their applications. Mechanical behaviour and processing of plastics, Future of plastics.

Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses.

Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses.

Performance of materials in service: Brief theoretical consideration of fracture, fatigue, and corrosion and its control.

Text / Reference Books:

1. W.D. Callister Jr. "Material Science & Engineering Addition" - Wesley Publishing Co.
2. Van Vlash, "Elements of Material Science & Engineering", John Wiley & Sons

[BTOE-48] DISCRETE MATHEMATICS

UNIT-I

Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle.

Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation.

Function: Definition and types of function, composition of functions, recursively defined functions.

UNIT-II

Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III

Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (n^{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit-IV

Algebraic Structure: Binary composition and its properties definition of algebraic structure; Group, Semi group, Monoid, Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-V

Graphs:

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, types of tree (rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Finite Automata: Basic concepts of Automata theory, Deterministic finite Automata (DFA), transition function, transition table, Non Deterministic Finite Automata (NFA), Mealy and Moore Machine, Minimization of finite Automata.

Text/Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
2. V. Krishnamurthy, "Combinatorics: Theory and Applications", East-West Press.

[BTOE-49] APPLIED LINEAR ALGEBRA

UNIT-1

Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence. Basis, dimensions and coordinates (each and every fact to be illustrated by suitable examples).

UNIT-2

Linear-transformation, definition and examples, matrix representation, similarity, range and kernel, rank-nullity theorem and its consequences.

UNIT-3

Singular and non singular linear transformations, sum and product of linear transformations, vector space of linear transformations, nilpotent linear transformations.

UNIT-4

Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inequality, Minkowski Inequality, polarization Identity, complete orthonormal set, Bessel's Inequality, Gram-Schmidt's orthogonalization process.

UNIT-5

Linear functional, definition and examples, vector space of linear functional, dual vector spaces, adjoint, self adjoint, unitary and normal operators, examples and properties, eigen values and eigen vectors, diagonalisation of linear operators, quadratic forms, principle axis theorem(without proof), some applications to engineering problems.

TEXT/REFERENCE BOOKS

1. Dym, H. Linear Algebra in action, University Press.2012
2. Halmos, P.R.: Finite Dimensional Vector Spaces (1990) Narosa.

[BTCE-51] GEOTECHNICAL ENGINEERING

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

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, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, 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. Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and $c-\phi$ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT. Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies. Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, “Soil Mechanics & Foundation Engineering”, John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.
4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering

[BTCE-52] TRANSPORTATION ENGINEERING-I

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR) Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB), Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.
2. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.

References:

1. Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi – 110 006
2. Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi

[BTCE-53] ENVIRONMENTAL ENGINEERING – I

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control. Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows. Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.

Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Text Books:

1. Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.
3. Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).
5. Seinfeld, J.H. and Pandis, S.N. "Atmospheric Chemistry and Physics: From Air Pollution to Climate Change", John Wiley
6. <http://cpcb.nic.in/>, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi

[BTCE-54] STRUCTURAL ANALYSIS-II

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope- Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Text Books & References:

1. Jain, A. K., "Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C., "Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.
4. Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem

[BTCE-55] DESIGN OF CONCRETE STRUCTURE-1I

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.

Text Books & References:

1. IS: 456 – 2000, “ Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2. Jain, A.K., “Reinforced Concrete: Limit State Design”, Nem Chand & Bros., Roorkee.
3. Gambhir, M L ,”Fundamentals of Reinforced Concrete”, Prentice Hall of India.

[BTMB-51]

Engineering Economics

Unit-1 Introduction to Engineering Economics and Managerial Economics Concept of Efficiency, Theory of Demand , Elasticity of Demand, Supply and Law of Supply indifference Curves, Budget Line, Welfare Analysis, Scope of Managerial Economics, Techniques and Applications of Managerial Economics.

Unit-2 Market Structure Perfect Competitions Imperfect- Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

Unit-3 Demand Forecasting and cost Estimation Characteristics of Forecasts, Forecasting Horizons, Steps to Forecasting, Forecasting Methods, Seasonal Adjustments, Forecasting Performance Measures, Cost Estimation, Elements of cost, Computation of Material Variances Break-Even Analysis.

Unit-4 Management Aspects Functions of Management, Project Management, Value Engineering, Project Evaluation, Decision Making.

[BTCE-51P] GEOTECHNICAL ENGINEERING LAB

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).
8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remolded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remolded soil sample by an oedometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

References:

1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

[BTCE-52P] TRANSPORTATION ENGINEERING LAB

LIST OF EXPERIMENTS

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.
10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.

References:

1. Khanna S. K., Justo C.E.G, & Veeraragavan A., “Highway Materials and Pavement Testing”, Nem Chand and Bros., Roorkee- 247 667.
2. Gambhir, M.L., Jamwal, Neha,” Lab Manual: Building and Construction Materials, Testing and Quality Control” McGraw Hill Education (India), Pvt.Ltd., Noida.

[BTCE-53P] CAD LAB I

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS 5.10

[BTCE-54P] ESTIMATION COSTING & VALUATION

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., “Estimation and Costing in Civil Engineering (Theory and Practice)”, UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, “A Text book of Estimation Costing and Valuation” Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., “Estimating Construction Costs” Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

[BTCE-61] DESIGN OF CONCRETE STRUCTURE II

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Text Books & References

1. IS : 456 – 2000, “ Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2. Jain, A.K., “Reinforced Concrete : Limit State Design”, Nem Chand & Bros., Roorkee.
3. Dayaratnam, P, “Limit State Design of Reinforced Concrete Structures” Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Gambhir, M L ,”Fundamentals of Reinforced Concrete”, Prentice Hall of India.
5. Unnikrishna Pillai, S. & D. Menon, “ Reinforced Concrete Design”, Tata Mc-Graw Hill Company Limited.
6. Jain, O. P. & Jai Krishna, “ Plain and Reinforced Concrete”, Vol. I & II, Nem Chand & Bros., Roorkee.
7. Park, R. and T. Pauley,” Reinforced Concrete Structures”, John Wiley & Sons.
8. Dayaratnam, P,”Reinforced Concrete Design”, Oxford & IBH.

[BTCE-62] ENVIRONMENTAL ENGINEERING – II

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control. Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets. Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling. Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen – Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters. Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design. Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc. Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor. Other emerging technologies for wastewater treatment: Duckweed pond, vermiculture, root zone technologies, sequential batch reactor (SBR) etc. Solid waste Management: Definition of solid waste and its classification, Hazardous waste, Prevailing regulations of solid waste management in India. Noise Pollution: Definition, Sources, Prevailing noise standards in India.

References:

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
5. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban
2. Development, Government of India, New Delhi
3. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi

[BTCE-63] CONSTRUCTION TECHNOLOGY & MANAGEMENT

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owning and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

References:

1. Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira “ Construction Planning Equipment and Methods” McGraw Hills Education (India), Private Ltd.,New Delhi.
2. Srinath, L.S., “PERT and CPM Principals and applications” Affiliated East-West Press Pvt. Ltd., New Delhi.
3. Patil, B.S., “Civil Engineering Contracts and Estimates” University Press India, Pvt. Ltd. Hyderabad – 500 004
4. Construction Management by Ojha
5. Srivastava, U.K.,”Construction Planning and Management”, Galgotia Publications Pvt. Ltd., New Delhi.
6. Construction Technology By Sarkar, Oxford.

[BTCE-64] ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources & solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

References:

1. EIA Manuals of MOEF (Available on [http://envfor.nic.in/essential-links/eiaspecific_ manuals](http://envfor.nic.in/essential-links/eiaspecific_manuals) and <http://envfor.nic.in/division/introduction-8>)
2. Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website
3. Environmental Impact Assessment-Training resource manual, UNEP 2001
4. Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,
5. George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
6. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
7. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
8. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

[BTCE-65] RURAL WATER SUPPLY AND SANITATION

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies. Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

References:

1. 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
2. Operation and maintenance of rural water supply and sanitation systems by Brikké F
3. 'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.,
4. WHO 'Water Supply and Sewerage', by E.W.Steel & T.J.Mcghee, McGraw Hill.
5. 'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.
6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

BTMB-61 : INDUSTRIAL MANAGEMENT

Unit-I Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

Unit-II Management Function: Principle of Management – Time and motion study, work simplification – process charts and flow diagrams, Production Planning.

Unit-III Inventory Control: Inventory, Cost, Deterministic Models, Introduction to supply chain management.

Unit-IV Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.

[BTCE-61P] STRUCTURAL DETAILING LAB

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., “Structural Design and Drawing” University Press (India), Pvt. Ltd., Hyderabad.

[BTCE-62P] ENVIRONMENTAL ENGINEERING LAB

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM10 with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

References:

1. A.P.H.A. “Standard Methods for the Examination of Water and Wastewater”, American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. “Chemistry for Environmental Engineering”, Mc-Graw Hill.
3. Mathur, R.P. “Water & Wastewater Testing”, Lab Manual, Roorkee.

[BTCE-63P] CAD LAB II

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)
2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.
3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)
4. Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)

[BTCE-64P] SURVEY CAMP

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map. The course will be run in the form of a camp for 7 working days and will involve the following components:

1. Reconnaissance of the area to be mapped.
2. Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.
3. Detail digital mapping using Total station/GPS.
4. Preparing a digital map using open source mapping software and report writing.

SEMESTER-VII

QUALITY MANAGEMENT

UNIT-I

Quality Concepts:

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales And services, guarantee, analysis of claims.

UNIT II

Quality Management Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT -V

ISO 9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details.

Design of Steel Structures

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria

Unit -2

Simple Connections—Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design.

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design.

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases.

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams,

Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder

.

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

WATER RESOURCES ENGINEERING

Unit-I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, **Precipitation** : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation (PMP) curves.

Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, **Unit Hydrograph**: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.

Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation.

Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

Engineering Hydrology

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation.

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation;
Evapotranspiration- measurement and estimation; Initial Losses- Interception & Depression storage;
Infiltration- process, capacities indices, measurement & estimation

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting.

Tunnel Engineering

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels

Unit-4

Micro tunneling techniques , Tunnel support design

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel

SEMESTER-VIII

TRANSPORTATION ENGINEERING - II

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications.

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas.

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment.

UNIT – 5

Water Transport Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses. Inland waterways: advantages and disadvantages; Development in India. Inland water operation.

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
- 2 . Railway Engineering by M. M. Aggrawal.

WATER RESOURCES SYSTEMS

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis.

Unit-II

System Techniques in Water Resources: Optimization using calculus, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization.

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection.

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation.

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedinger, and Haith, D. A. – Water Resources Systems Planning & Analysis,

RIVER ENGINEERING

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works.

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson
4. Principles of River Engineering by (the non tidel alluvial) PH Jameen India.

[BTOE-81] NON CONVENTIONAL ENERGY RESOURCES

UNIT I

Introduction

Various non conventional energy resources Introduction, availability, classification, relative merits and demerits.

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations.

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations

UNIT IV

Thermo electrical and thermionic Conversions:

Principle of working, performance and limitations

.Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT V

Bio mass:

Availability of biomass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations. Waste Recycling Plants. Automation” Wily Eastern.