

ARYABHATTA KNOWLEDGE UNIVERSITY

Patna, Bihar

Syllabus for Bachelor of Technology (B.Tech.) Civil Engineering Program



INCLUDES

- ✓
- ✓ **Course Structure**
- ✓ **Detailed Syllabus**

B. Tech. SEMESTER-I

Sr. No	Course Code	Subject	L-T-P	Credits
1	24 1x05	Communicative English (Group A)	3-1-0	4
	01 1x02	Environmental Science (Group B)	3-0-3	5
2	21 1x01	Mathematics-1	3-1-0	4
3	22 1x01	Physics (Group A)	3-0-3	5
	23 1x01	Engineering Chemistry (Group B)	3-0-3	5
4	03 1x01	Basic Electrical Engineering (Group A)	3-0-3	5
	01 1x01	Engineering Mechanics (Group B)	3-0-3	5
5	061x01	Fundamentals of information Technology(Group A)	3-0-2	4
	021x01	Elements of Mech. Engineering (Group B)	3-0-2	4
6	021x02	Engineering Graphics (Group A)	2-0-4	5
	021x03	Workshop (Group B)	0-0-6	4
7	GE 1x01	EAA-I-NSS		
		TOTAL :-	16-2-16	27

B. Tech. SEMESTER-II

Sr. No	Course Code	Subject	L-T-P	Credits
1	24 1x05	Communicative English (Group B)	3-0-0	3
	01 1x02	Environmental Science (group A)	3-0-3	5
2	21 1x01	Mathematics –II	3-1-0	4
3	22 1x01	Physics (Group B)	3-0-3	5
	23 1x01	Engineering Chemistry (Group A)	3-0-3	5
4	03 1x01	Basic Electrical engineering (Group B)	3-0-3	5
	01 1x01	Engineering Mechanics (Group A)	3-0-3	5
5	06 1x01	Fundamentals of information technology (group B)	3-0-2	4
	02 1x01	Elements of Mech. engineering (Group A)	3-0-2	4
6	02 1x02	Engineering graphics (Group B)	2-0-4	5
	02 1x03	workshop (Group A)	0-0-6	4
7	GE 1x01	EAA- II-NSS		
		TOTAL :-	16-1-16	26

**COURSE STRUCTURE FOR B. TECH. PROGRAM
BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING**

B.Tech.(Civil Engg.) SEMESTER-I								
Program	Semester	Course code	Course title	L	T	P	Credits	Total Credit/ Sem.
CEUG	1	24 1x05	COMMUNICATIVE ENGLISH	3	1	0	4	
CEUG	1	22 1101	PHYSICS	3	0	3	5	
CEUG	1	21 1x01	MATHEMATICS-I	3	1	0	4	
CEUG	1	03 1x01	BASIC ELECTRICAL ENGINEERING	3	0	3	5	
CEUG	1	06 1x01	FUNDAMENTALS OF INFORMATION TECHNOLOGY	3	0	2	4	
CEUG	1	02 1x02	ENGINEERING GRAPHICS	2	0	4	5	
CEUG	1	GE 1x01	EAA-I-NSS					27
B.Tech.(Civil. Engg.) SEMESTER- II								
CEUG	2	01 1x02	ENVIRONMENTAL SCIENCE	3	0	3	5	
CEUG	2	23 1x01	ENGINEERING CHEMISTRY	3	0	3	5	
CEUG	2	21 1x02	MATHEMATICS II	3	1	0	4	
CEUG	2	01 1x01	ENGINEERING MECHANICS	3	0	3	5	
CEUG	2	02 1x01	ELEMENTS OF MECHANICAL ENGINEERING	3	0	2	4	
CEUG	2	02 1x03	WORKSHOP	0	0	6	4	
CEUG	2	GE 1x02	EAA-II-NSS					27
B. Tech (Civil Engg.) Semester – III								
CEUG	3	24 1x01	ORGANIZATIONAL BEHAVIOUR AND INDUSTRIAL PSYCHOLOGY	3	0	0	3	
CEUG	3	01 1x03	BUILDING SCIENCE	3	0	3	5	
CEUG	3	01 1x05	ENGINEERING GEOLOGY	3	0	2	4	
CEUG	3	01 1x07	FLUID MECHANICS	3	1	2	5	
CEUG	3	01 1x14	CIVIL ENGINEERING DRAWING	0	0	3	2	
CEUG	3	24 1x06	INDUSTRIAL ECONOMICS & ACCOUNTANCY	3	1	0	4	
CEUG	3	21 1x03	MATHEMATICS - III	3	1	0	4	
CEUG	3	GE 1x03	EAA III-NSS					27
B. Tech (Civil Engg.) Semester – IV								
CEUG	4	01 1x04	FIELD MEASUREMENT (SURVEYING)	3	0	3	5	
CEUG	4	01 1x06	MECHANICS OF SOLID – I	3	1	2	5	
CEUG	4	01 1x10	HYDRAULICS AND OPEN CHANNEL FLOW	3	0	0	3	
CEUG	4	05 1x01	OBJECT ORIENTED	3	0	3	5	

			PROGRAMMING					
CEUG	4	21 1x04	NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUE	3	0	3	5	
CEUG	4	02 1x07	THERMODYNAMICS	3	1	0	4	
CEUG	4	GE 1x04	EAA -IV-NSS					27

B. Tech (Civil Engg.) Semester – V

Program	Semester	Course code	Course title	L	T	P	Credits	Total Credit/ Sem.
CEUG	5	01 1x08	ADVANCED SURVEYING	3	0	3	5	
CEUG	5	01 1x09	SOIL MECHANICS	3	0	3	5	
CEUG	5	01 1x11	STRUCTURAL ANALYSIS-I	3	1	0	4	
CEUG	5	01 1x12	ENGINEERING HYDROLOGY	3	0	2	4	
CEUG	5	01 1x13	MECHANICS OF SOLID –II	3	0	0	3	
CEUG	5	02 1x10	FLUID MACHINERY	3	0	3	5	26

B. Tech (Civil Engg.) Semester – VI

CEUG	6	01 1x15	SOIL AND ROCK MECHANICS	3	0	3	5	
CEUG	6	01 1x16	STRUCTURAL ANALYSIS –II	3	0	0	3	
CEUG	6	01 1x17	DESIGN OF CONCRETE STRUCTURE-I	3	0	3	5	
CEUG	6	01 1x18	ENVIRONMENTAL ENGINEERING-I	3	0	3	5	
CEUG	6	01 1x19	TRANSPORTATION ENGINEERING-I	3	0	3	5	
CEUG	6	01 1x20	DESIGN OF STEEL STRUCTURES	2	0	3	4	27

B. Tech (Civil Engg.) Semester – VII

CEUG	7	01 1x26	DESIGN OF CONCRETE STRUCTURE - II	3	0	3	5	
CEUG	7	01 1x25	DESIGN OF HYDRAULIC STRUCTURES	3	0	3	5	
CEUG	7	01 1xxx	ELECTIVE-I	3	0	0	3	
CEUG	7	01 1x23	ENVIRONMENTAL ENGINEERING -II	3	0	0	3	
CEUG	7	01 1x22	FOUNDATION ENGINEERING	3	0	0	3	
CEUG	7	01 1x24	TRANSPORTATION ENGINEERING-II	3	0	0	3	
CEUG	7	01 1x29	PROJECT-I	0	0	5	3	
CEUG	7	01 1x21	CIVIL ENGINEERING PROFESSION &PRACTICE OR VOCATIONAL TRAINING(DURING SUMMER FOR 4 WEEKS AFTER 6TH SEMESTER	0	0	3	2	27

B. Tech (Civil Engg.) Semester – VIII

Program	Semester	Course	Course title	L	T	P	Credits	TotalCredit/
---------	----------	--------	--------------	---	---	---	---------	--------------

		code						Sem.
CEUG	8	01 1x27	CONSTRUCTION PLANNING AND MANAGEMENT	3	0	0	3	
CEUG	8	01 1x28	CONTRACT, SPECIFICATION & ESTIMATION	0	0	3	2	
CEUG	8	01 1xxx	ELECTIVE – II	3	0	0	3	
CEUG	8	01 1xxx	ELECTIVE -III	3	0	0	3	
CEUG	8	01 1xxx	ELECTIVE - IV	3	0	0	3	
CEUG	8	01 1x52	IRRIGATION ENGINEERING	3	0	0	3	
CEUG	8	011x29	PROJECT-II(IN CONTINUATION OF 7TH SEM. PROJECT	0	0	15	10	27

B.Tech.(civil engg.) Elective – I

CEUG	EL 1	01 1x51	FINITE ELEMENT METHODS	3	0	0	3	
CEUG	EL 1	01 1x53	COMPUTER AIDED DESIGN	3	0	0	3	
CEUG	EL 1	01 1x54	WATER AND LAND MANAGEMENT	3	0	0	3	
CEUG	EL 1	01 1x55	AIR POLLUTION ENGINEERING	3	0	0	3	
CEUG	EL 1	01 1x56	DESIGN OF STEEL STRUCTURE -II	3	0	0	3	
CEUG	EL 1	01 1x60	SOLID WASTE MANAGEMENT	3	0	0	3	
CEUG	EL 1	01 1x61	TRAFFIC ENGINEERING	3	0	0	3	
CEUG	EL 1	01 1x62	INTRODUCTION TO EARTHQUAKE RESISTANT DESIGN METHODS	3	0	0	3	
CEUG	EL 1	01 1x87	ADVANCED SOIL MECHANICS	3	0	0	3	
CEUG	EL 1	01 1x88	ADVANCED STRUCTURAL ANALYSIS	3	0	0	3	

B. Tech (Civil Engg.) Elective – II

CEUG	EL 2	01 1x59	STRUCTURAL DYNAMICS	3	0	0	3	
CEUG	EL 2	01 1x52	GEOGRAPHICAL INFORMATION SYSTEM AND REMOTE SENSING	3	0	0	3	
CEUG	EL 2	01 1x57	RIVER HYDRAULICS AND SEDIMENT TRANSPORT	3	0	0	3	
CEUG	EL 2	01 1x58	CIVIL ENGINEERING DRAWING USING AUTO CAD	3	0	0	3	
CEUG	EL 2	01 1x76	ADVANCED FOUNDATION ENGINEERING	3	0	0	3	
CEUG	EL 2	01 1x86	GROUND WATER ENGINEERING	3	0	0	3	
CEUG	EL 2	01 1x56	AIRPORT PLANNING	3	0	0	3	

			AND DESIGN					
B. Tech (Civil Engg.) Elective – III								
CEUG	EL 3	01 1x71	DESIGN OF WATER RETAINING, PLATE AND SHELL STRUCTURES	3	0	0	3	
CEUG	EL 3	01 1x72	INDUSTRIAL WASTE TREATMENT	3	0	0	3	
CEUG	EL 3	01 1x73	TRANSPORTATION SYSTEMS AND PLANNING	3	0	0	3	
CEUG	EL 3	01 1x74	WATER RESOURCES PLANNING AND MANAGEMENT	3	0	0	3	
CEUG	EL 3	01 1x75	SOIL DYNAMICS	3	0	0	3	
Program	Semester	Course code	Course title	L	T	P	Credits	Total Credit/ Sem.
B. Tech (Civil Engg.) Elective – IV								
CEUG	EL 4	01 1x77	WATER POWER ENGINEERING	3	0	0	3	
CEUG	EL 4	01 1x78	BRIDGE ENGINEERING	3	0	0	3	
CEUG	EL 4	01 1x79	SYSTEM ENGINEERING	3	0	0	3	
CEUG	EL 4	01 1x80	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	0	3	
CEUG	EL 4	01 1x81	PR-STRESSED CONCRETE DESIGN	3	0	0	3	
CEUG	EL 4	01 1x82	DESIGN OF DAMS	3	0	0	3	
CEUG	EL 4	01 1x85	FLOOD & DROUGHTS	3	0	0	3	
CEUG	EL 4	01 1x89	DISASTER MANAGEMENT AND MITIGATION	3	0	0	3	

PRACTICALS

Eight experiments based on the theory papers in the relevant semesters.

ELECTIVES THEORY AND PRACTICAL

- 09 17E1 COSMETIC TECHNOLOGY
- 09 17E2 HERBAL DRUG TECHNOLOGY
- 09 17E3 BIOASSAYS
- 09 17E4 HOSPITAL PHARMACY ADMINISTRATION
- 09 17E5 ADVANCED PHARMACEUTICAL ANALYSIS

DEPARTMENT OF MATHEMATICS

21 1x01 MATHEMATICS-I

L-T-P : 3-1-0

Credit : 4

1. **ALGEBRA OF MATRICES** : Elementary transformation, inverse by row transformation, canonical reduction, rank, solution of simultaneous equations, characteristic equation, Eigen values – & Eigen vectors, Caley's Hamilton theorem, similarity transformation, reduction to diagonal matrices. **Lecture : 8**

2. **DIFFERENTIAL CALCULUS** : Higher order derivatives (successive differentiation) and Leibnitz theorem, indeterminate form, Tangent and normal, review of maxima & minima, concavity and convexity of a curve point of inflexion, curvature and radius of curvature, pedal equation asymptotes (for Cartesian curve only) Taylor's and Maclaurin's series, partial derivatives, Euler's theorem on homogeneous function, harmonic function, Taylor's expansion of several variables, maxima and minima of several variable, Lagrange's method for undetermined multipliers. **Lecture : 20**

3. **DIFFERENTIAL EQUATION** : First order equation, separable, homogeneous, exact, linear and Bernoulli's form, second and higher order equation with constant coefficients, Euler's equation: methods of their solution. dependent and independent of solution, Wronskian's system of first order equation **Lecture : 8**

4. **INTEGRAL CALCULUS - I** : Convergence of improper integral – comparison test. Abel's test, beta & gamma functions (definition & related problems), error function, differentiation under integral sign – Leibnitz rule. **Lecture : 8**

Text Books :

1. Advance engineering mathematics by H.K.Dass, S.Chand & Company Ltd.
2. Higher engineering mathematics by B.S. Grewal, Khanna Publishers
3. Differential calculus by Das & Mukherjee –U.N. Dhar & sons
4. Integral calculus by Das & Mukherjee – U.N. Dhar & sons

Reference Books :

1. Advance engineering mathematics by E. Kreyszig, 8th Edition, John Wiley & Sons, New York
2. Advance engineering mathematics by Wiley & Barratt- Tata McGraw Hill
3. Linear Algebra by K. Hoffman and R Kunze-Prentice Hall

21 1x02 MATHEMATICS –II

L-T-P : 3-1-0

Credit : 4

1. **INFINITE SERIES** : Notion of convergence and divergence of infinite series - Ratio test, comparison test, Raabe's test, Root test, alternating series – Leibnitz test absolute and conditional convergence. Uniform convergence. **Lecture : 6**

2. **FOURIER ANALYSIS** : Periodic function : functions of arbitrary period, Even & odd functions, Half Range Expansions, Harmonic analysis, Complex Fourier series, Laplace transform: Definition and properties of Laplace transform, shifting theorem, transform of derivatives and integrals, Multiplication by t^n , Division by t , Evaluation of integrals by L.T., Inverse Transforms. **Lecture : 14**

3. **INTEGRAL CALCULUS II** : Double & Triple integrals, Rectification, computation of surfaces & volumes, Change of variables in double integrals, Jacobians of transformations, Integrals dependent on parameters- applications. **Lecture : 12**

4. **VECTOR CALCULUS** : Scalar & vector point function, differentiation of vector, velocity and acceleration, direct derivatives, concept of gradient, divergence curl, line integral, Greens theorem in plane, Gauss & Stoke's theorem and simple application. **Lecture : 12**

Text Books :

1. Advance engineering mathematics by R.K.Jain & S.R.K. Iyengar, Narosa publishing house
2. Higher engineering mathematics by Wiley & Barrett-Tata McGraw hill

Reference Books :

1. Advanced engineering mathematics by Wiley & Barrett – Tata McGraw Hill
2. Advanced engineering mathematics by E. Kreyszig 8th edition, John Wiley & sons. New York
3. Vector analysis 2nd edition by Chatterjee, Prentice Hall of India

21 1x03 MATHEMATICS – III

L-T-P: 3-1-0

Credit : 4

1. ORDINARY DIFFERENTIAL EQUATIONS & SPECIAL FUNCTIONS : Series solution of differential equations (Frobenius method), Bessel's equation, Its solution, Bessel's function of first & second kind, Recurrence formula, Legendre's equation, Its solution, Legendre polynomials, Rodrigue's formula, Orthogonality of Legendre polynomial.

Lecture : 10

2. PARTIAL DIFFERENTIAL EQUATION : Basic concept, 1st & 2nd order linear & quasi – linear partial differential equation, Classification of second order P.D.E., Boundary and initial conditions, wave equations, Separation of variables, use of fourier series, D'Alembert's solution of wave equation, Heat equation, Solution by fourier series.

Lecture : 10

3. COMPLEX ANALYSIS - I : Function of complex variables – limit, continuity, differentiability and analyticity of functions Cauchy-Riemann equations, Laplace's equation, harmonic function, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent series, Residues and its applications to evaluating real integrals.

Lecture : 10

4. PROBABILITY & STATISTICS : Theorems on probability, including Baye's rule, Random variable – cumulative distribution function, Probability mass function, probability density function, Mathematical expectation, mean variance, moment, generating function & characteristics function, standard probability models Binomials, Poisson exponential, Weibull, normal and lognormal, sampling & sampling distribution, Chi- square and F distributions, large and small sample tests of significance.

Lecture : 12

Text Books :

1. Advanced Engineering Mathematics by R.K.Jain & S.R.K. Iyengar
2. Higher engineering mathematics by B.S. Grewal
3. Fundamentals of mathematical statistics by V.K.Kapoor & S.C. Gupta- sultan & sons

References :

1. Advance Engineering Mathematics by E.Kreyszig 8th edition , John Wiley & sons
2. Complex variable and applications by Churchill & Brown –McGraw hill
3. Elements of Partial Differential equation by I.N.Sneddon - McGraw Hill
4. Introduction to Probability & Statistics for engineering by S.M.Ross – John Wiley and Sons, New York.

21 1304 NUMERICAL METHOD & COMPUTATIONAL TECHNIQUE

L-T-P : 3-1-0

Credit : 4

1. Introduction to computer language : Machine language, assembly language, higher level language, compilers, problem solving using computer algorithm, flow chart, examples.

Lecture : 5

2. C/C++ Programming : Constant & variables, arithmetic expression, I/O statement, specification statement, control statements, subscripted variables, logical expression, function and subroutines, examples of programming should include numerical as well as non numeric applications, matrix operations, searching , sorting etc.

Lecture : 15

3. Iterative Techniques for solution of equations :

i. Solution of non linear equation - Simple iteration scheme, Bisection method, Regula-falsi method, Newton - Raphson method, Secant method, their rates of convergence, order of errors etc.

Lecture : 5

ii. Solution of linear equation – Gaussian elimination, matrix inversion by Gauss method, computation of determinants, Jacobi and Gauss Seidel iteration method.

Lecture : 4

4. Polynomial approximation : Interpolation, several form of interpolating polynomials like Lagrangian interpolation of polynomial and Newtons forward and backward difference formula, curve fitting(least square) .

Lecture : 6

5. Numerical integration : Trapezoidal method, Simpson's rule, order of errors in integration.

Lecture : 4

6. Solution of initial value problem : Euler's method, Runge-Kutta second order and fourth order methods, solution of boundary value problem - Finite difference method.

Text Books:

1. Numerical methods for scientific and engineering computations by M.K. Jain, S.R.K. Iyengar, and R.K.Jain, New Age International Publishers, New Delhi.
2. Introductory Method of Numerical Analysis by S.S. Sastry, Prentice Hall of India Pvt. Ltd.

Reference Books

1. Numerical Analysis in Engineering by Rama B. Bhat, S. Chakravarty, Narosa Publishing House.
2. Advanced Engineering Mathematics by E.Kreyszig, 8th edition by John Wiley & Sons, New York.

21 1x05 DISCRETE MATHEMATICAL STRUCTURE & GRAPH THEORY

L-T-P : 3-1-0

Credit : 4

UNIT-I:

Mathematical Logic and Set Theory: Statement and Notation, Negation, Conjunction, Disjunction, Tautologies, Truth tables, Basic concepts of set theory, Inclusion and equality of sets, The power set, Ordered pairs and n-tuples.

UNIT-II:

Relations and Functions: Relation and ordering, Properties of Binary Relations in a set Relation Matrix and the Graphs a Relation, Partition and Covering of a set. Equivalence relation, Partial ordering, Partially ordered set, Functions (definition and introduction), Composition of functions, Inverse functions, Characteristics function of a set.

UNIT-III:

Group Theory: Semigroups and Monoids(definitions and examples), Homomorphism of semigroups and monoids, Subsemi groups and submonoids, Groups(definitions and examples) Subgroups and Homomorphisms, Cosets and Lagrange's theorem, Normal subgroups, Codes and group codes.

UNIT-IV:

Rings(definition and examples): Integral domains ring homomorphisms, Ideals of Ring polynomial.

UNIT-V:

Graph Theory: Basic concepts of Graph Theory, Basic definitions, Paths and circuits. Reachability and connectedness, Matrix representation of graphs, Trees and their representation and operations, Rooted trees, Path lengths in rooted trees, Multi graphs and weighted graphs, Shortest paths in weighted graphs.

TEXT BOOKS:

1. Discrete Mathematics Structures with application to Computer Science by J. P. Tremblay & R. Manohar.
2. Discrete Maths for Computer Scientists & Mathematicians. (Chapter 2, 5, 7) by J. L. Mott, A. Kandel, T. P. Baker

REFERENCES:

Elements of Discrete Mathematics by C. L. Liu.
Discrete Mathematics by Lipschutz
Discrete Mathematics by R. Johnsonbaugh.

DEPARTMENT OF PHYSICS

22 1x01 PHYSICS

L-T-P : 3-0-3

Credit : 5

1. ELECTROSTATICS AND ELECTROMAGNETIC THEORY : Dielectrics -

The three electric vectors, Gauss's law in Dielectrics, Energy stored in Electrostatic field, Boundary Conditions. Continuity Equation for charge, Displacement current, Maxwell's Equations in Differential and Integral form and their Physical significance, Maxwell's Equations in free space and speed of plane electromagnetic waves travelling in vacuum. Poynting theorem and Poynting vectors, electromagnetic waves propagation in dielectrics and conductors.

Lecture : 9

2. OPTICS & LASER : Temporal coherence Michelson's interferometer for measurement of coherence length of source and line width, Spatial coherence, Measurement of spatial coherence using young's Interferometer Fraunhofer diffraction by single slit, double slit and grating.

Lasers and Laser light, Einstein A and B coefficient, Population inversion, Light amplification by optical resonator. Characteristics of Laser, Ruby laser, Working Principle of He-Ne Laser.

3. POLARISATION : Unpolarised light, Production of plane polarised light by Polaroid technique (Principle of action should be emphasized) Brewster's Law, Malus's Law, Double Refraction, Production of Plane, Circular and elliptical, Polarized Light, Analysis of unpolarised light and polarized light, Magneto-optic effect, electro optic effect and photo elastic effect.

Lecture : 7

4. QUANTUM PHYSICS : Planck's theory of black body radiation, Compton effect, Photo electric effect, Einstein photo electric equation and its experimental verification

Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and group velocity, Division and Germer experiment, Heisenberg's uncertainty principle, Application of uncertainty principle.

Wave functions and wave equation, physical interpretation of wave function and normalization condition, Expectation values, Schrodinger's wave equation (Time dependent and time independent i.e. steady, state form) in one dimension, quantum-mechanical operators, Particle in a box (Infinite Potential Well), Finite Potential barrier and tunneling.

5. **SPECIAL THEORY OF RELATIVITY** : Michelson-Morely experiment, Postulates of special theory of relativity, Consequence of special theory of relativity, Lorentz transformation and its application. (Length contraction and time dilation)
6. **NANO-PHYSICS** : Introduction and Basic definition of Nano Technology, Properties of Nano particles, Elementary ideas of Synthesis of Nano particles, Application of Nano Technology.

Text Books :

1. Concept of Modern Physics by Arthur Beiser: Publication: TMH
2. Elements of electromagnetics by Mathew N.O. Sadiku: Publication: Oxford University Press
3. Introduction to electrodynamics by David J. Griffiths; Pub.: Pearson Education.
4. Optics by Ajoy Ghatak Pub; TMH
5. Fundamentals of Physics extended volume by Resnick, Halliday and Walker; Pub.: John Wiley & Sons. Inc. Asian Edition.
6. Electromagnetic Theory (Electrodynamics) – Dr. K.K.Chopra & G.C.Agrawal, K.Nath & Co.
7. Engineering Physics – Hitendra K.Malik & Ajay Kumar Singh by TMH Publication.

Reference Books :

1. Modern Physics by G. Aruldas & P. Rajagopal; Pub: Prentice Hall of India.
2. Quantum Physics by H.C. Verma Pub.: Surya Publication .
3. Lasers and Non-Linear Optics by B.B. Laud; Pub: New Age International (P) Ltd.
4. Principles of electricity by Leigh Page and Normal Ilesley Adams, Pub.: Eurasia Publishing House, New Delhi.

22 1X01 PHYSICS LABORATORY

Minimum eight experiments are required to be performed in a semester :

1. To determine acceleration due to gravity by a Bar Pendulum.
2. To determine input & output characteristics of a PNP Junction Transistor in CE Mode or configuration.
3. To determine Planck's constant.
4. To determine capacitance and permittivity.
5. To measure the numerical aperture of an optical fiber.
6. To obtain the wave length of laser source using grating.
7. To obtain the particle size by Laser
8. To obtain forbidden energy gap of Semiconductor Diode.
9. To obtain loss of energy from transformer and ferrites.
10. To obtain Dielectric constant.
11. To obtain Curie temperature
12. To obtain focal length by Convex mirror using u-v method.

DEPARTMENT OF CHEMISTRY

23 1x01 ENGINEERING CHEMISTRY

L-T-P : 3-0-3

Credit : 5

1. **WATER TREATMENT** : Introduction, characteristics imparted by impurities in water, hardness of water, unit of hardness. Estimation of hardness of water. Disadvantage of hard water, scale and sludge formation in boilers. Caustic embrittlement, Boiler corrosion, Priming and Foaming, Softening methods (soda lime process). Numerical problems.

Lecture : 7

2. **COLLIGATIVE PROPERTIES** : Osmosis, Osmotic pressure, Determination of osmotic pressure, Isotonic Soln., Hypertonic solution, Hypotonic solution Lowering of Vapour Pressure, Determination of molecular weight, Elevation in B.P., Depression in F.P. and their uses in the determination of molecular weight, Abnormal behavior. Numerical problems.

Lecture : 7

3. **ELECTRO POTENTIAL AND CELLS** : Single electrode potential – definition, sign convention. Construction of Galvanic cell – Classification – Primary, Secondary and Concentration cell. E.M.F. of a cell, definition of Galvanic cell, notation and convention of Galvanic cell. Measurement of single electrode potential and standard electrode potential by Nernst equation. Numerical problems.

Lecture : 7

4. **FUELS** : Definition, Classification,

ANALYSIS OF COAL : Proximate and ultimate analysis of coal.

SYNTHESIS OF PETROL : Bergius process and Fischer Tropsch process.

CALORIFIC VALUE : Definition, Gross and net calorific value, Determination of calorific value of solid/liquid fuel using Bomb calorimeter.

COMBUSTION CALCULATION : Analysis of flue gas by Orsat's apparatus.

Numerical problems.

Lecture-7

5. **HIGH POLYMERS** : Definition, Classification – Natural and synthetic polymers with examples.

POLYMERIZATION : Definition, Types of polymerizations, addition and condensation with examples, Mechanism of Polymerization - Free radical mechanism (ethylene as an example),

Glass transition temperature, Compounding of resins synthesis – Property and application of Teflon, PMMPA and Phenol Formaldehyde Resin. **Lecture : 7**

6. **CORROSION SCIENCE** : Corrosion – Definition, Chemical corrosion and electro chemical theory of corrosion. Types of corrosion – Differential aeration corrosion, Pitting corrosion, Water line corrosion, Stress corrosion. Factors affecting the rate of corrosion. Protective measures against corrosion by (i) Modification of environment (ii) Modification of metals (iii) Use of protective coatings. **Lecture : 7**

23 1X01 CHEMISTRY LABORATORY

1. To determine the mol. wt. of a non-volatile substance *urea) by Lands Berger's method/Cottrells' method.
2. To determine the apparent molecular weight of a non-volatile substance (boric acid) in benzene and to determine its degree of association.
3. To determine the velocity constant of hydrolysis of methyl acetate catalyset by HCl
4. To determine the velocity constant of inversion of cane sugar by acids.
5. To determine the total order of reaction between oxalic acid and chromic acid.
6. To determine electrode potential (E^0) of Ag/Ag⁺ or Cu/Cu²⁺ or Zn/Zn²⁺
7. To study concentration cells and hence to determine the value of $2.303RTF=k$
8. To estimate Hardness of Water
9. To determine pH of Solution
10. Quantitative Analysis of different ions in inorganic salt mixtures.
11. Test of Adulteration in fat, butter, sugar, turmeric powder, chili powder and pepper.
12. Determination of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) of value of sewage volumetrically.
13. Organic Preparation: Preparation of Aspirin.
14. Test of different organic substances and their functional groups.
15. Analysis of flue gas by Orsat apparatus.
16. To determine the viscosity of a liquid or solution.

Text Books :

1. Chemistry in engineering and technology ; vol-I and II,by J. C. Kuriacose and J.Rajram; Pub.: TMH
2. Engineering chemistry; by Jain and Jain; Pub: Dhanpat Rai Publication
3. A text book of engineering chemistry by Shashi Chawla; Pub.: Dhanpat Rai & Co.
4. Engineering chemistry by B. K. Sharma; Pub.: Krishna Prakashan Media (P) Ltd.
5. Essentials of experimental engineering chemistry by Shashi Chawla, Pub.: Dhanpat Rai and Co.

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCE

24 1301 ORGANIZATIONAL BEHAVIOR & INDUSTRIAL PSYCHOLOGY

L-T-P : 3-0-0

Credit : 3

1. **Concept of organization** & organizational Behavior.

Lecture : 2

2.

(a) Personality : meaning, concept , determinants, personality theories (psychoanalytic Theory, Trait Theory and Self Theory).

(b) Perception-meaning , concept, process of perception, significance of perception.

(c) Learning- meaning, concept, nature, component of learning process.

(d) Attitude- meaning, concept, factors in attitude formation, method of finding Employee's attitude.

(e) Value - Meaning and types, value and attitude – similarity and difference.

(f) Motivation- meaning, theory of motivation (Maslow's Theory & Herzberg's Theory).

Lecture : 11

3.

(a) Group & Group Dynamics - concept, importance, classification of groups , reason for group, formation, group cohesiveness.

(b) Team work :meaning , concept, types , creating, an effective team.

Lecture : 4

4.

(a) Communication- concept, process, importance, barrier.

(b) Organizational conflict- meaning, concept, types, stages of conflict, resolution of conflict.

(c) Power & politics- nature and concept, Ethics of power & politics, types of power.

(d) Leadership- concept, qualities and functions of a leader, approaches to the analysis of leadership

Lecture : 8

5. **Concept of organization theory**, concept of organization structure, form of organizational structure, form of organizational culture.

Lecture : 7

6.

(a) Organizational effectiveness - concept , approaches, criteria of effectiveness.

(b) Organizational change - meaning, factors in Organizational change, process of planned change.

(c) Organizational Development - concept ,need of organizational development, difference between organizational development & management development.

Lecture : 7

Text Books :

1. Organizational behavior by Stephen P. Robbin & Seema Sanghi- pearson
2. Organizational behavior by L.M. Prasad-S Chand & sons

Reference Book :

1. Organization behavior: managing people and organization by Gregory moorehead – Biztantra
- 2.

24 1X02 PERSONNEL MANAGEMENT AND INDUSTRIAL RELATION

L-T-P: 3-0-0

Credits: 3

1. **Meaning, concept, function**, & importance of personnel management, role of a personnel manager, personnel policies - Need of a personnel policies, organization of personnel Department (functional basis, service basis and chentile basis)

Lecture : 5

2. **Manpower planning** : Meaning & concept, need for manpower planning, types of manpower planning, meaning and concept of job analysis, job description & job specification, uses of job analysis information, Recruitment, selection – meaning and steps of selection process, meaning of induction

Lecture : 8

3. **Training and develop** : Meaning, need & importance for training, method of training, development - meaning of development, method of development.

Lecture : 5

4. (a) Performance appraised : Meaning, Objective, method of performance appraisal .

(b) Transfer : meaning objective, types.

(c) Promotion : Meaning , policies, basis of promotion.

(d) Separation : Resignation, Discharge & Dismissal, Suspension & Retrenchment, Layoff.

Lecture : 6

5. Wages and salary administration :

(a) Meaning purpose & principle of wage & salary administration, factors influencing wage & salary administration.

(b) Meaning of wage & salary, minimum wage , fair wage & living , wage.

(c) Meaning of money and real wage.

(d) Methods of wage payment - time rate & piece rate.

(e) Incentive- Financial Incentive & non financial Incentive, method of wage payment based on result.

Lecture : 7

6. (a) Health, safety and welfare facilities.

(b) social security -

(i) meaning and concepts, objective.

(ii) form of social security- social insurance & social assistance.

(c) Problem arising from disease , invalidity , accident, old age and unemployment.

Lecture : 5

7. (a) Industrial Relation : meaning & concept, changing concept of industrial relation, role played by the employer, trade union & government, current I. R. position in India, I.R. policies of government of India.

(b) Trade Union : Meaning and concept, objective, functions, type, method of trade union.

Lecture : 6

Text Books :

1. Personal management by C.B. Memoria & G.V. Gankar- Himalaya

2. Personal management & industrial relation by P.C. Tripathi-S. Chand

Reference Book :

1. Industrial relation, Trade Union & Labour Relation by G.P. Sinha & PRN Sinha, Pearson.

24 1X03 SOCIOLOGY AND BUILDING ECONOMICS

L-T-P: 2-1-0

Credit : 3

1. **Definition scope and use of sociology**, its application in architecture.

Lecture : 2

2. **Basic concept of sociology**, society, groups, community association, institution, culture, civilization and personality in terms of their characteristics and types.

Lecture : 5

3. **Social structure of India** : Caste and class and marriage and family, their characteristics.

Lecture : 5

4. **Rural and urban societies** : Their characteristics, features and problem , like crime, slum and poverty.

Lecture : 4

5. **Social change** : Biological , technological, and cultural factors of social changes , social aspects of housing and neighbourhood in the context of changing society and growing populations.

Lecture : 4

6. **Elements of economics** : Concept of utility, total utility, and avg. utility, law of equimarginal utility, concept of demand – factors governing demand for building .

Lecture : 4

7. **Production** : Concept of production, factors of production, land, labour, capital, entrepreneur and organization, their characteristics, laws of diminishing returns, division of labours, efficiency of labour.

Lecture : 5

8. **Distribution of national income** : Rent, wages, interest and profits-inequalities in income distribution causes and courses, roles of demand and supply in the determination of price and under perfect condition.

Lecture : 5

9. **Money and Banking** : Function of money – inflation and deflation, and their affects on building industry , functions of central and commercial bank

Lecture : 5

10. **Concept of economic planning**, objectives of the five years plans with special reference of housing.

Lecture : 3

Text Books :

1. Modern Micro Economic Theory by H.L. Ahuja, S. Chand.

2. Advance Economic Theory by M.L. Jhingan, Konark Publication

Reference Book :

1. A text book of Economic Theory by Stonier & Hague, Pearson.

24 1x04 ENGINEERING ECONOMICS AND MANAGEMENT

L-T-P: 3-0-0

Credit : 3

1. ENGINEERING ECONOMY :

Lecture : 7

- (a) Simple and compound interest, Annuities.
- (b) Basic methods for making economy studies - (i) Present worth method (ii) future worth method (iii) I.I.R. methods.
- (c) Comparison of alternative – (i) Present worth method (ii) future worth method.

2. **MANAGEMENT AND ORGANIZATION :** (a) Principle of management, (b) element of management, planning, organization direction and control (c) Organizational structure – line, line and staff, functional, divisional, project & Matrix Organizational.

Lecture : 7

3. **PERSONNEL MANAGEMENT :** (a) function, Recruitment, selection, Training promotion, discipline, (b) Job evolution, (c) Merit rating, (d) wedge and incentive.

Lecture : 8

4. **MARKETING MANAGEMENT :** (a) Marketing research and sale forecasting (b) Sales management (c) advertisement and sales promotion.

Lecture : 7

5. **ACCOUNTING :** Meaning, scope and role of accounting concept and convention, accounting as an information system, Recording of transaction in journal and ledgers, trial-balance preparation of final account.

Lecture : 9

6. **ENTREPRENEURSHIP DEVELOPMENT :** Introduction to entrepreneurship, rural entrepreneurship, women entrepreneurship, factor affecting entrepreneurship growth.

Lecture : 4

Text Books :

1. Engineering economics by Degarmo, Sullivan & Canada, McMillan
2. Double entry book keeping by T.S. Grewal- S. Chand.
3. Principles and practice of management by LM. Prasad - S. Chand & sons.
4. Personnel management by C.B. Memoria & G.V. Gankar- Himalaya
5. Development entrepreneurship by Udai parekh & T Venkateshwara.

Reference Book :

1. Marketing management by P. Kotler.

24 1x05 COMMUNICATIVE ENGLISH

L-T-P : 3-1-0

Credit : 4

1. **Basic Grammar:** Structural pattern, single word substitution: Editing tenses of Verbs.

Lecture : 6

2. Common errors, comparison, Syntax.

Lecture : 6

3. Antonyms, Homonyms, Comprehension based on topics of Science & Technology

Lecture : 4

4. Precis, Paragraph Writing, Technical description

Lecture : 4

5. Expansion (worked & phrase)

Lecture : 3

6. Official Correspondence, Memorandum, Circular letter.

Lecture : 3

7. Applying for a job, Resume

Lecture : 4

8. Business Correspondence, Report Writing, E-mail.

Lecture : 4

9. Phonetics (Symbol and Transcription), Pronunciation

Lecture : 4

10. Reading –developing Reading skill.

Lecture : 4

11. Group Discussion.

Text Book :

1. English grammar and Effective Business Communication by M.A. Pink & S.E. Thomas – S.Chand & Company Ltd.
2. English grammar by Dr. D .Thakur
3. Comprehensive English grammar by C.J.Joseph & EG Myall – Inter Univ. Press.
4. Technical English by Sharon j Garson and Steve M Garson
5. Gartside's Model Business Letters by Shirley Taylor – Pitman Publishing.

Reference Books :

1. Communication in English for Technical Student by Orient Longman
2. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan - Tata McGraw Hill
3. English Pronouncing Dictionary by Daniel Jones. Revised by A.C.Gimson – Universal Book Stall, Delhi.
4. A Student's Grammar of the English Language by Sidney Greendaum & Randolph Quirk (Pearson Education)

24 1306 INDUSTRIAL ECONOMICS & ACCOUNTANCY

L-T-P : 3-1-0

Credit : 4

- 1. Various definitions of Economics :** Nature of Economic Problem, Relation between science, Engineering. Technology & Economics **Lecture : 3**
- 2. Meaning of demand,** Law of Demand, Elasticity of demand, Practical importance & application of the concept of elasticity of Demand **Lecture : 5**
- 3. Meaning of Production and factor of Production :** Land, labor, Capital ,Entrepreneur & Organization –their Characteristics law of variable Proportion .Return to Scale **Lecture : 5**
- 4. Cost Analysis :** Various concept of cost, Cost function, Short & Long run cost. Concept of Revenue ,Break-Even Analysis **Lecture : 5**
- 5. Meaning of Market :** Type of market – Perfect completion, Monopoly ,Oligopoly ,Monopolistic competition ,Main feature of these market), Meaning of Supply and Law of Supply, Role of Demand & Supply in price in prime determination imperfect competition **Lecture : 7**
- 6. Engineering Economy :**
(a) Simple and compound interest, Annuities, (b)Basic methods For making economy Studies - (i) Present worth method, (ii) Future worth method (iii)I.R.R method (c) Comparison of alternative – (i) Present worth method, (ii) Future Worth method (iii) I.R.R method. **Lecture : 7**
- 7. Accounting:** Meaning Scope and Role of accounting , Accounting concept & Convention. Accounting as information System. Recording of transaction in journal and Ledgers. Trial –Balance, Preparation of final Account. **Lecture : 9**

Text Book :

1. Modern Micro Economics by Theory - H.L.Ahuja-S.Chand
2. Advance Economic Theory by M .L.Jhingan- Konark Publication
3. Engineering Economics by Degarmo , Sullican & Canada –McMillan
4. Double Entry Book Keeping by T.S.Grewal –S .Chand

Reference Books :

1. Stonier & Hague by A test book of Economic Theory-Pearson
2. Industrial Organisation and Engg. Economics by Banga & Sharma

24 1×07 SUSTAINABLE DEVELOPMENT

L-T-P : 3-1-0

Credit : 4

- 1. Ecosystem:** Concept, Type, Structure, Function; Ecological succession, Pyramid, degradation and its remedies from Unsustainable development to sustainable development, Concept of sustainable development: Social and environmental issues (local, national and international), Need for studying the economics for sustainable development 10 lectures
- 2. Environment and Rehabilitation:** Mined area, Habitats, Water bodies, Mangroves; Global Changes, Biodiversity concerns and precautionary principles, Evaluation of sustainable development 10 lectures
- 3. Valuing Market and Non-Market Ecosystem:** Use of monetary valuation, Cost benefit analysis, Technique of monetary valuation, Definition of conventional and green GNP 10 lectures
- 4. International trade and sustainable development:** Free trade and globalization vs environment and community, obstacle of free trade 08 lectures
- 5. Strategic approaches and laws to sustainability:** New international institutional contexts, commission on sustainable development; Environmental ethics and laws, India's move towards sustainable development 04 lectures

Books Recommended

1. S. Deswal, A. Deswal, An Introduction to environmental science, Dhanpat Rai and Co.
2. N. Das Gupta, Environmental Accounting, Wheeler and co.
3. Daly H.E, Beyond Growth: The Economics of Sustainable Development, Beacon Press
4. D.K. Asthana, Meera Asthana, Environmental Science, S. Chand and co.
5. P.Rogers, K.F Jalal and J.A Boyd, An introduction to sustainable development, Earthscan

Referance Book

1. Willian P. Cunningham, Mary Ann Cunningham, Principles of environmental science, T.M.H

DEPARTMENT OF CIVIL ENGINEERING

01 1×01 ENGINEERING MECHANICS

L-T-P : 3-0-3

Credit : 5

Theory :

1. **Statics** : Force System : Moment of a force about a point and an axis; Equivalent force and moment, Wrench
Lecture : 7
2. **Equilibrium** : Free body diagram; equations of equilibrium; problems in two and three dimension; plane frames and trusses .
Lecture : 6
3. **Friction** : Laws of Coulomb friction, impending motion problems involving large and small contact surfaces ; square threaded screw; principle of virtual work and stability.
Lecture : 8
4. **Dynamics** : Kinematics and kinetics of particles dynamics in rectangular coordinates cylindrical coordinates and in terms of path variables.
Lecture : 6
5. **Properties of areas** : Center of mass; Moments of inertia; kinematics of rigid bodies; Chasle's Theorem, concept of fixed vector; velocity and acceleration of particles in different frames of references. General plane motion; Euler's equation of motion.
Lecture : 8
6. **Work & Energy** and impulse and Momentum methods for particles and rigid bodies : Conservation of momentum, coefficient of restitution, moment of momentum equation.
Lecture : 7
(vector approach to mechanics will be followed for all the topics)

Text Book :

1. Engineering Mechanics by Shames, Pearson's Education .
2. Mechanics for Engineers. Beer, F.P. and Johnston. Tata McGraw Hill. New Delhi
3. Engineering mechanics. Meriam Wiley pub.

Reference Books :

1. Engineering Mechanics. Timoshenko. McGraw Hill Inc.

Practical :

1. Practical based on mechanical advantage of different machines.
2. Moment of inertia.
3. Problem solving based on theory classes.

01 1×02 ENVIRONMENTAL SCIENCE

L-T-P : 3-0-3

Credit : 5

Theory :

1. **Sustaining Resources** : Environmental Quality : Water & Air Pollution. Effects and control of air and Water pollution; Introduction to solid waste and its management. Pollution of groundwater. Surface water and soils. Noise pollution; Renewable and Nonrenewable energy source.
Lecture : 11
2. **Toxicological Chemistry** and effects and risks of it on human health
Lecture : 6
3. **Environmental Chemical** Analysis
Lecture : 6
4. **Humans and Sustainability**, Ecology and Sustaining Biodiversity
Lecture : 7
5. **Policy and legislation** for environmental protection. Current Environmental issues.
Lecture : 6
6. **Policy and legislation** for environmental protection, Current Environmental Issues.
Lecture : 6

Text Books :

1. Introduction to Environmental Engineering and Science, G.M. Masters. Pearson Education
2. Environmental Science. Miller, Thomson Press .
3. Environmental Science, Wright, Pearson Education.
4. Principles of Environmental SCIENCE, W.P. Cunningham, Tata McGraw Hill.
5. Environmental Chemistry, Sawyer and McCarty, McGraw Hill
6. Environmental Chemistry, Manahan Stanley E. Lewis Publishers.

Practical :

1. Case Analysis based on theory.
2. Determination of simple environmental parameters in laboratory.
3. Paper Presentation on current environmental issues.

01 1303 BUILDING SCIENCE

L-T-P : 3-0-3

Credit : 5

Theory :

1. **Building construction** : Overview of building process; Introduction to Building Law and IS Codes Different types of loads in Buildings, Load Combinations, IS Code provisions for Loads in Buildings.
Lecture : 7

2. **Foundation** : shallow foundation (simple calculation) **Lecture : 5**
3. **Super structure** : Load bearing masonry, arches, lintels, scaffolding, formwork, Floors and roofs – flat and pitched roofs, concerning, floor finishes staircase and other element of construction; Doors and windows, Building services – vertical transportation, plumbing electrical, Ventilation and Air-conditioning, Energy efficiency, Fire protection, Acoustic and sound insulation. Damp proofing, termite proofing, Carpentry and joinery. **Lecture : 10**
4. **Concrete** : Concrete making materials, properties and types of cement, properties of concrete in fresh and hardened state, durability, spatial coherence **Lecture : 7**
5. **Building stones** : Varieties of Indian stones. Quarrying blasting Dressing of stones, characteristics of good building stones, Slate, Marble artificial stones. Stone preservation. Brick and brick masonry; Manufacture properties. Classification and specification, Brick masonry and principles of design of masonry structure. **Lecture : 9**
6. **Timber steel** : Properties and types miscellaneous materials; polymers and plastics .composites and smart materials. **Lecture : 6**

Text books :

1. Concrete Technology by Neville, A. M. & Brooks, J. J. Pearson Education
2. Civil Engineering Materials by Jackson, N. & Dhir, R. K, ELBS.
3. Building Construction by S. C. Renewal, Character publishing house Amend 1993
4. Civil Engineering Materials, TTTI Chandigarh
5. Construction Technology by Tony Bryan , Wiley
6. Advance Concrete Technology by Zogjin Li , Wiley

Reference Books :

1. "Construction Technology - Volumes 1 and 2, 2nd Edition" by R. Crudely, Longman, UK
2. Building Construction – volumes 1,2,3, and 4, 5th Edition by W. B .McKay. Orient Longman UK 1993
3. "Materials for civil and construction Engineers" by Michael S. Mamlouk and JOHN P. Zaniwski, Addison Longman Inc. USA
4. "Smart structure : Analysis and Design" by A. V. Srinivasan and D. M. McFarland, Cambridge" University UK, 2001.

Practical:

1. Laboratory testing of materials
2. Load Calculations based upon IS Code.
3. Calculation on Brick structure design.

01 1x04 FIELD MEASUREMENT

L-T-P: 3-0-3

Credit : 5

Theory :

1. **Introduction** : Types of surveying, scale, principle of surveying, shrinkage of Maps. **Lecture : 4**
2. **Chain surveying** : Types of chain, Handling .Erroneous chain Equipments .Principle of chain and equipments, Method of chain survey .Obstacles ,Field book and recording. **Lecture : 7**
3. **Compass surveying** : Prismatic compass Bearings Traversing ,Local attraction, Adjustment .Plane Table survey .Equipments and uses principle of surveying .Closing error and adjustment methods of locating features .Two point problem and three point problem .Advantages and disadvantage Telescopic alidade. **Lecture : 9**
4. **Leveling** : Scope terms ,Equipments ,Types of level, Adjustment of dumpy level .Methods of leveling book and computation, missing data, Curvature and refraction correction. Reciprocal leveling contouring : Definition, Methods of contour survey, and plotting of contour. Area and volume. **Lecture : 9**
5. **Theodolite** : Scope, Types, Adjustment of transit theodolite. Measurement of horizontal angles ,Errors and elimination, Methods of traversing, computation of bearings. Coordinate system Gale's traverse table, Missing data, plotting **Lecture : 8**
6. **Tachometry** : Instrument, Tachometric constant. Analytic lens, principle, Computation, Beaman's Stadia arc, Subtense bar and subtense method, Tachometric plane table, Traversing, plotting. **Lecture : 8**

Text Books :

1. Surveying vol I and II by B. C Punmia, A. K Jain and A. K. Jain Laxmi Publications (P) Ltd., New Delhi.
2. Surveying, vol. I and II by K. R. Arora, Standard Book House, Delhi
3. Surveying : Theory and Practice by R. E. Davis, F. S. Foote and J. W. Kelly, McGraw Hill Book company
4. Surveying and Engineering by Paul Wastson , Wiley.

Practical :

Chain Survey, Compass Surveying, Plane Table Survey, Traversing, Leveling and Layout of a building.

01 1305 ENGINEERING GEOLOGY

L–T–P : 3–0–2

Credit : 4

Theory:

- 1. Basic Geology** : General Geology, Mineralogy, Petrology (igneous, sedimentary and metamorphic), Structural geology, Crystallography. **Lecture : 06**
- 2. Engineering properties of rocks** : Geomorphology (Geomorphic processes weathering, Erosion, Origin and formation of solids). **Lecture : 06**
- 3. Geological hazards** (landslides, earthquakes and volcanoes), Groundwater, Recent concepts in Geology, Plate tectonics and Sea – floor spreading. **Lecture : 07**
- 4. Applied Geology** : Geophysical mapping : seismic, resistivity, gravity, radar, geotomography, logging; Geological exploration of an engineering site. **Lecture : 08**
- 5. S. I. Desk Study** : Site investigation Boreholes: Remote sensing, GIS and GPS: Basic principle and their applications in studying and monitoring Lithosphere, Hydrosphere, Cryosphere and Atmosphere. **Lecture : 08**
- 6. Cut Slopes in rocks and clays**; Geological factors affecting the construction of dams, reservoirs and tunnels. Criteria and factors for site selection for Dam, tunnels, waste/radioactive disposal sites, Indian Geology, Outline of stratigraphy of India. **Lecture : 10**

Text Books:

1. Principles of Engineering Geology by Johnston. R. B. and DeGraff. J. V., John Wiley and Sons, New York.
2. Fundamental of Engineering Geology by Waltham, T., Spon Press, London.
3. A Textbook of Engineering and general Geology by Singh. P., S. K. Kataria and Sons, New Delhi.
4. A Textbook of Geology by Mukherjee P. K., Te world press Pvt. Ltd., Kolkata.
5. Engineering Geology by D V Reddy, Vikash Publishing House Pvt. Ltd.
6. Element of Mineralogy in Engineering Geology by Read, H. H. Rutley's, CBS Publisher.
7. Experiments in Engineering Geology by Gokhale, K. V. G. K. and Roa, D. M., Tata McGraw Hill.

Practical:

Mineralogy, Optics, Study of rocks in hand specimen and under microscope; Topographical maps; Structural Geological maps; Structural Geological problems; Engineering Geographical maps and Engineering Geological experiment; Geological fieldwork in and around Patna.

01 1X06 MECHANICS OF SOLID - I

L-T-P : 3-1-2

Credit : 5

Theory :

- 1. Rigid and deformable solids**; Stress and strain : Tension, compression and shear. **Lecture : 4**
- 2. Analysis of stresses**, Basic Equilibrium equations, analysis of Strain Deformation, Strain Displacement Relations, Normal and shear Strains. **Lecture : 7**
- 3. Transformation**, principal stresses and strains, Maximum Stresses & Strains, Mohr's Circle, volumetric Strain, compatibility Equations and boundary conditions, Strain rosettes, Velocity Field and Strain Rates. Generalized Hook's Law & Constitutive Relations for Solids, Elastic constants and their relations. **Lecture : 6**
- 4. Method of sections** for evaluating internal forces in bodies, review of free body diagrams; axial force, shear and bending moment diagram. **Lecture : 4**
- 5. Axially loaded members force** and deflections; Thermal Stresses. **Lecture : 3**
- 6. Bending & shear** : classical theory, various cross-sectional shapes and composite sections of beams, shear stresses in beams. **Lecture : 4**
- 7. Deflection of beams** : Bending deflection of simple beams by direct integration, singularity function method, Moment – Area Methods, deflection due to shear. **Lecture : 4**
- 8. Torsion** : torsion of circular shaft, close coiled helical springs, Torsion of thin walled open and closed sections and non-circular sections. **Lecture : 6**
- 9. Combined stress**; principle of superposition and its limitations. **Lecture : 4**
- 10. Introduction** to energy methods. **Lecture : 3**

Text Books :

1. Mechanics of Solids by E.P. Popov, Pearson Education Pub.
2. Solid Mechanics by S.M.A. Kazimi, Tata McGraw Hill, New Delhi.
3. Strength of Materials by Ryder, G.H., Macmillan Press Ltd.
4. Solid Mechanics by Bhavikatti Vikash, Publishing House Pvt. Ltd.

Reference Book :

1. Mechanics of Solids : An Introduction by S.H.Crandall, N.C.Dahi and T.V. Lardner, McGraw Hill

International and Tokyo.

Practical :

1. Tensile Test for M.S.
2. Hardness
3. Impact Test
4. Test for Anisotropic Substance – Wood, etc.

01 1307 FLUID MECHANICS

L-T-P : 3-1-2

Credit : 05

Theory:

Introduction, fluid properties: density, viscosity, compressibility, ideal and real fluids.

Lecture : 04

1. **Hydrostatics**; fluid force on plane and curved surfaces, manometry, buoyancy, uniformly accelerated motion. **Lecture : 06**
2. **Kinematics of fluid flow**. Generalized continuity equation, Irrotational motion and solution to Laplace equation. Concept of stream lines, Equipotential Lines, Flow Nets. **Lecture : 09**
3. **Dynamics of fluid flow**, Control volume concepts, Euler and Bernoulli's theorems and various application like pivot tube, venturimeter, orifice meter, notches and weir etc; Impulse momentum theory and application. **Lecture : 10**
4. **Introduction to Navier Stokes Equation**. Flow of fluid in closed conduits, Laminar flow of viscous incompressible fluids, Darcy-Weisbach equation, Moody's diagram, and Minor losses Hardy-cross method for pipe networks. **Lecture : 09**
5. **Forces on immersed bodies**, concepts of separation, drag force, circulation and lift force. Dimensional Analysis, Model Similitude : Theory and application. **Lecture : 08**

Reference Book/ Text Books:

1. Fluid Mechanics by V.L.Streeter, E.B. and Wylie, McGraw Hill.
2. Fluid Mechanics by Fox & McDonald, John Wiley.
3. Fluid Mechanics by Munson, John Wiley.
4. Fluid Mechanics by F.M. White.
5. Fluid Mechanics with Engineering Application by R.L. Daugherty, J.B. Franzini, E.J. Finnermore; McGraw Hill, International Ed.
6. I.H. Shames by Fluid Mechanics, PHI.

Practical:

Viscosity, Metacentric height. Orifice meter, Notches, Reynolds number, Impact of jet.

01 1X08 ADVANCED SURVEYING

L-T-P : 3-0-3

Credit : 5

Theory:

1. **Curve** : (a) simple curve - Scope, degree of curve, characteristics, offset from tangent, offset from chord produced. Rankine's method, obstacles. (b) Compound and reverse curve – introduction of cases. (c) Transition curve –compound curve, super elevation, length of transition curve, characteristics equations, shift, tangent length and curve length of combined curve. Computation for setting out of combined curve (d) Vertical curve – scope, assumption of vertical curve, equations, computations for setting out curve, summit and valley curve. **Lecture : 10**
2. **Electronic Distance meter** : Scope, electromagnetic curve, basic definitions, phase of wave, types of waves, distance by transit time and phase difference, carrier wave, method of modulation. Electro-optical EDM measurement, infra-red EDM instrument, microwave EDM instruments, effect of atmospheric conditions and corrections, slope and height corrections, use of total station. **Lecture : 9**
3. **Triangulation** : Scope, classification, inter-visibility, satellite station, eccentricity of signals, base line and extension of base line. Theory of error terms, laws of weight, determination of M.P.V., M.P.E, adjustment of geodetic triangle with central station, adjustment of level line, adjustment of spherical triangle. **Lecture : 10**
4. **Astronomical Survey** : Terms, spherical triangle, spherical trigonometry. Time, sidereal time, apparent time, mean solar time, equation of time, universal time, standard time, conversion of time, determination of time, determination of azimuth, Latitude, Longitude. **Lecture : 4**
5. **Geodetic Leveling** : Scope, curvature and refraction correction, axis-signal correction, single angle observation, reciprocal leveling. **Lecture : 8**

6. Hydrographic Surveying : Scope, methods of sounding, locating of sounding, three-point problem and shoreline survey. **Lecture : 5**

Text Books:

1. Geodesy by G.L Hosmer, John Wiley & sons, New York.
2. Surveying vol. II and III by B.C. Punmia, A.K. Jain, Laxmi Publications (p) Ltd. New Delhi.
3. Surveying, vol. II and III by K.R. Arora, Standard Book House, Delhi.
4. The Elements of Astronomy for surveyors by J.B. Mackie, Charles Griffin and Company Ltd., High Wycombe, England.
5. Electromagnetic Distance Measurement by C.D. Burnside, Crosby Lockwood and son Ltd., London.

Practical:

Triangulation, Setting out complex curve, Contour plotting etc.

01 1x09 SOIL MECHANICS – I

L-T-P: 3-0-3

Credit : 5

Theory:

1. **Introduction**, Origin and Classification of soils, soil weight volume relationships, Index properties of soil, soil structures and Clay Minerals. **Lecture : 8**
2. **Effective stress principle**, Surface tension and capillarity, Permeability of soils, Darcy's law, test for determination of permeability, engineering use of permeability. Factors affecting permeability. **Lecture : 4**
3. **Seepage analysis**, flow nets, flow through dams. **Lecture : 4**
4. **Effective stress** distribution in soils under hydrodynamic conditions. Quick sand, Piping, Prevention of piping failures. . **Lecture : 4**
5. **Compressibility and Consolidation**:- Consolidation Process- Spring analogy, Definition, measurement of consolidations- Determination of void ratio at various load increments, Terzaghi's theory of one dimensional consolidation, Determination of Coefficient of consolidation, Analysis of consolidation data. **Lecture : 10**
6. **Vertical stress** below applied load in soils (Boussinesq, Westergaard, and graphical solutions), one and two-dimensional cases. **Lecture : 5**
7. **Compaction characteristics**, water content – dry unit weight relationships, OMC, max, Dry unit weight field compaction control. **Lecture : 5**
8. **Soil stabilization** **Lecture : 2**

Text Books :

1. A Text Book of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, Saikripa Technical consultants, Bangalore.
2. Geotechnical Engineering by S. K. Gulati et. al., TMH Publication Co. Ltd., New Delhi
3. Basic and applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, Wiley Eastern Ltd., New Delhi.
4. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Pub. and Dist., Delhi

Reference Books :

1. Soil Mechanics in Engineering Practice by Terzaghi and Pech, John Wiley and Sons Inc New York.
2. Soil Mechanics by Lamb and Whitman, Wiley Eastern Pvt. Ltd., New Delhi.
3. Fundamentals of Soil Mechanics by Taylor, John Wiley and Sons Inc New Delhi.

Practical :

Specific Gravity of Soil, Field Density of soils, Particle size distribution of soils by sieving, Particle size distribution of soils by hydrometer method. Determination of Atterberg's limits, Permeability of soils using falling head method, Permeability of soils using constant head method, Consolidation Characteristics of soils, Proctor's Compaction Test.

01 1x10 Hydraulics & Open Channel Flow

L-T-P : 3-0-0

Credit : 3

Theory :

- 1. Concepts of boundary layer flow** : Introduction, boundary layer growth over a flat plate, Boundary layer thickness, laminar boundary layer, turbulent boundary layer, transition from laminar to turbulent flow. **Lecture : 8**
- 2. Basic concepts of Open Channel flow** : Effect of gravity and viscosity on the flow behaviour, prismatic and non-prismatic channels. **Lecture : 5**
- 3. Uniform flow** : Theoretical uniform flow equations; hydraulically efficient sections, velocity distribution in open channels, equation for velocity distribution, velocity distribution coefficients. **Lecture : 6**
Non-uniform flow : specific energy, Critical flow in a rectangular channel, Discharge curve, Dimensionless specific energy and discharge curve, applications of specific energy, momentum principle applied to open channel flow, specific force, small waves and surges applied to an open channel. **Lecture : 8**
- 4. Gradually varied flow** : Equation of gradually varied flow, classification of channel slopes; classification and examples of surface profiles, computation methods for length of surface profile. **Lecture : 10**
- 5. RVF. Hydraulic jump** : Formation, length and loss of energy in a hydraulic jump, Location, elements, characteristics and types of a hydraulic jump. **Lecture : 6**
- 6. Introduction to Unsteady flow.** **Lecture : 2**

Text Books :

- Flow in Open Channels by K.G. Ranga, Raju, Tata McGraw Hill Publication Co. Ltd., New Delhi.
- Flow in Open Channel by K.Subramanya, Tata McGraw Hill Publication Co. Ltd., New Delhi.
- Fluid Mechanics by A. K. Jain, Khanna Publishers, Second Edition, Delhi-6, 1980

Reference Books :

- Open Channel Hydraulics by V.T.Chow, McGraw Hill International, New York, 1959.
- Foundation of Fluid Mechanics by S.W. Yuan, Tata McGraw Hill Publication Co. Ltd., New Delhi.
- Open Channel Hydraulics by R.H. French, McGraw Hill Book co., New York, 1986.
- Boundary Layer Theory by H.Schlichting, 7th Edition, McGraw Hill Book co., New York, 1979.

01 1X11 STRUCTURAL ANALYSIS - I

L-T-P : 3-1-0

Credit : 4

Theory :

- 1. Basic introductory concepts** : structural systems, elements, joints, stability, equilibrium, compatibility, indeterminacy, types of loading. **Lecture : 3**
- 2. Force-displacement relation**, free-body diagrams; analysis of forces in statically determinate structures : trusses (including compound and complex trusses), beams and frames (including internal hinges), cables and three-hinged **Lecture : 10**
- 3. Stability of Walled Structures** **Lecture : 3**
- 4. Influence lines** for beams and trusses under moving loads; Criteria for maxima. **Lecture : 7**
- 5. Work and energy principles** : principle of virtual work, potential energy and Clastingliano's theorems, complementary energy theorems, reciprocal theorems and Mueller Breslau's principle with applications. **Lecture: 7**
- 6. Analysis of displacements** in statically determinate structures : Unit (dummy) load and energy methods, moment area and conjugate beam methods, Williot-Mohr diagram. **Lecture : 5**
- 7. Introduction to Matrix Methods** for determinate structures : Flexibility & Stiffness Methods. **Lecture : 7**

Text Books :

- Elementary Structural Analysis by Norris, Wilbur and Utku, McGraw Hill.
- Basic Structural Analysis by C.S. Reddy, Tata McGraw Hill.
- Intermediate Structural Analysis by C.K.Wang, McGraw Hill
- Theory of Structures – Volumes 1 and 2 by S. P. Gupta and G. S. Pandit, Tata McGraw Hill.
- Structural Analysis by L.S.Negi & R.S.Jangid, Tata McGraw Hill.
- Application of Graphics in Engg. by L.B.Roy, Standard Pub. and Dist., Delhi.
- Structural Analysis Vol 1 by Bhavikatti Vikash ,Publishing House Pvt. Ltd

01 1X12 ENGINEERING HYDROLOGY

L-T-P : 3-0-2

Credit : 4

Theory :

- 1. Introduction** : Hydrologic cycle and processes, Precipitation, Infiltration and Evapotranspiration, Forms of precipitation, measurement, analysis, depth-area-duration and intensity-duration frequency relations. **Lecture : 7**
- 2. Evaporation** : Process, measurement and estimation, Infiltration process, measurement and estimation, Evapotranspiration measurement and estimation, Stream flow measurements. **Lecture : 6**
- 3. Runoff and Hydrographs**, Factors affecting flow hydrograph, Rainfall Runoff correlations, Flow duration curve, Mass curve, Unit hydrograph, its analysis and S-curve hydrograph. synthetic and instantaneous unit hydrographs. **Lecture : 7**
- 4. Statistical analysis**, flood frequency studies, Rational method, time Area curves, Design flood, Design Storm, Risk, reliability and safety factor. **Lecture : 8**
- 5. Channel and flood routing**, time series analysis of droughts and floods. **Lecture : 4**
- 6. Groundwater hydrology**, flow equations confined and unconfined flow, Well hydraulics Steady and unsteady flow, Well losses, Specific capacity. **Lecture : 6**

Reference/Text Books :

1. Engineering Hydrology by K. Subramanya, Tata McGraw Hill Pub., New Delhi.
2. Applied Hydrology by V.T.Chow et. al., McGraw Hill International, New York.
3. Elementary Hydrology by V.P.Singh Prentice Hall.
4. Groundwater by H.M.Raghunath, Wiley Easter Ltd.
5. Groundwater Hydrology by D.K. Todd, John Wiley and sons.

Practical :

Rainfall measurement, evaporation loss measurement, gauge discharge measurement, Infiltration, Hydraulic jump & hump.

01 1X13 MECHANICS OF SOLID - II

L-T-P : 3-0-0

Credit : 3

Theory :

- 1.Introduction** to elasticity theory; Simple 2D/3D problems and their solutions. **Lecture : 6**
- 2.Pure bending** of beams with unsymmetrical section; Shear Centre; Torsion of noncircular members. **Lecture : 6**
- 3.Curved Beams** : Beams on elastic foundation. **Lecture : 6**
- 4.Plastic Theory**, plastic hinges and shape factor, uniqueness, upper bound and lower bound theorems; Failure theories. **Lecture : 6**
- 5.Energy methods** : Introduction to viscoelasticity and viscoplasticity; Numerical methods **Lecture : 6**
- 6.Stability of Equilibrium** : columns, Euler's formula, Eccentric loading, end conditions and effective length, Practical Design formulae. **Lecture : 6**
- 7.Coupled axial force** and bending moment problems; coupled torsion and bending moment problems. **Lecture : 6**

Text Books :

1. Advanced Mechanics of Materials by A.P. Boresi and O.M. Sidebottom, Fifth Edition, Wiley, Singapore.
2. Mechanics of Solid, Singh by A.K., PHI, New Delhi.
3. Strength of Materials Vol. 2 by S.P. Timoshenko, CBS Publishers, Delhi.

01 1X14 CIVIL ENGINEERING DRAWING

L-T-P : 0-0-3

Credit : 2

Practical :

- ✓ Understanding of conventional signs and symbols.
- ✓ Drawing of various details of residential buildings components : bonds and brickwork, doors, staircases, simple foundations.
- ✓ Site and building planning : Site plants, simple one-bedroom house, two-storied house, multi-storied apartment building, framed buildings in steel and concrete.
- ✓ Industrial and laboratory buildings.

- Drawing of framework details, floor and roofing systems, masonry, load bearing and non-load bearing walls.
- Working drawings of buildings.
- Planning and layout of large-scale commercial facilities.
- Introduction to AutoCAD.

Text Books :

- (1) Building Drawing by B.P. Verma, Khanna Pub., Delhi
- (2) Engineering Drawing by N.D. Bhatt.

01 1X15 SOIL MECHANICS & ROCK MECHANICS

L-T-P : 3-0-3

Credit : 5

Theory :

1. Shear Strength of Soil : Engineering use of shear strength, Direct and triaxial shear tests, Mohr-Coulomb strength criterion, drained, consolidated undrained and undrained tests, strength of loose and dense sands, NC and OC soils, dilation, pore pressure and Skempton's pore pressure coefficients. **Lecture : 7**

2. Earth pressure theories & Retaining Walls : Limit equilibrium method, effect of wall movement on earth pressure, pressure at rest, Rankine state of plastic equilibrium, Coulomb's theory, Rebhann and Culmann's graphical methods. Sheet piles – Types and uses of sheet piles, Analysis of Cantilever and anchored sheet piles in cohesionless and cohesive soil, Rowe's theory of moment reduction. **Lecture: 5**

3. Stability of slopes : Limit equilibrium methods, methods of slices, simplified Bishop's method and friction circle method, factors of safety, stability under conditions of submergence, drawdown and steady seepage, location of critical arc, stability number, chart. **Lecture : 9**

4. Engineering properties of rocks : engineering classification of rocks, Surface and sub-surface investigation in rock including geophysical studies. **Lecture : 7**

5. Weathering of rocks : discontinuities, field and laboratory testing of rocks and rock masses, Stress- strain characteristics, Deformability of rocks, Friction and Shear strength, Slope stability, effect of water. **Lecture : 8**

6. Introduction to analysis and design of tunnels, blasting, bolting, tunneling techniques, application. Lecture : 6

Text Books :

1. A Text Book of Soil Mechanics and Foundation Engineering, Revised and enlarged 4th Edition 1993 by V.N.S. Murthy, Saikripa Technical Consultants, Bangalore.
2. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao, Wiley Eastern Ltd., New Delhi.
3. Soil Mechanics and Foundation Engineering by K.R.Arora, Standard Pub. and Dist., Delhi., 1992.
4. Introduction to Rock Mechanics by R.E. Goodman, John Wiley and Sons, New York.
5. Rock Mechanics and Engineering by Jacger, Charles, Cambridge University Press, London.

Reference Books :

- (1) Soil Mechanics in Engineering Practice by Terzaghi and Peck, John Wiley and Sons Inc. New York, 1967
- (2) Soil Mechanics by Lamb and Whitman, Wiley Eastern Pvt. Ltd., New Delhi, 1969.
- (3) Fundamentals of Soil Mechanics by Taylor, John Wiley and Sons Inc New York, 1948.
- (4) Tunnels : Planning, Design, Construction by Megaw, T.M. and J.V. Bartlett. International Edition, Ellis Horwood Limited, John Wiley and Sons, New York.

Practical : Direct Shear Test, Vane Shear Test, Unconfined Shear Test, Triaxial Shear Test, Brazilian test for tensile strength of rocks, Bending Test for tensile strength of rocks, Uniaxial Compressive Strength Test.

01 1x16 Structural Analysis – II

L-T-P : 3-0-0

Credit : 3

Theory :

(1) Analysis of statically indeterminate structures : fixed beams and propped cantilevers by conjugate beam method; Theorem of three moments. Influence lines for propped cantilevers, continuous beams and two – hinged arches. **Lecture : 12**

(2) Introduction to force and displacement methods : consistent deformation. **Lecture : 6**

(3) Energy method, slope-deflection and moment distribution; Analysis of 2 hinged arches. Lecture : 6

(4) Matrix formulation of force and displacement methods : Solution of simultaneous equations: Stiffness matrix approach with reference to computer application; generation of frame element stiffness matrix, Torsion effect; Concept of local effects, generation of load vector, Effects of finite joints; application to plane frames, space frames, grid structures. **Lecture : 12**

(5) Finite element Method for 2-D, Plane problems- introduction. Lecture : 6

(6) Introduction to Structural analysis Software.

Lecture : 2

Text Books :

- (1) Matrix analysis of framed structures by W.Weaver and J.M.Gore, Van Nostrand.
- (2) Basic Structural Analysis by C.S.Reddy, Tata McGraw Hill, New Delhi.
- (3) Theory of Matrix Structural Analysis by J.S. Przemieniecki, Dover, New York.
- (4) Structural Analysis – A Matrix Approach by G.S. Pandit and S.P. Gupta, Tata McGraw Hill, New Delhi
- (5) Matrix Methods of Structural Analysis by M.B. Karchi, Wiley Eastern, New Delhi.
- (6) Structural Analysis Vol II by Bhavikatti Vikash ,Publishing House Pvt. Ltd

01 1X17 DESIGN OF CONCRETE STRUCTURE - I

L-T-P: 3-0-3

Credit : 5

Theory:

- 1. Introduction to the design of concrete structure :** Working stress and Limit, State Analysis **Lecture : 6**
 - 2. Design of beams for flexure (Working Stress & Limit State Method)** **Lecture : 10**
 - 3. Bond, Shear and Torsion :** **Lecture : 8**
 - 4. One and two- way slabs.** Flat slabs. Ribbed slabs: **Lecture : 8**
 - 5. Axially and eccentrically loaded columns :** Isolated and combined footings. **Lecture : 10**
- (IS : 456 to be followed with limit state Design method or any other method as recommend in IS code)

Text Books:

1. IS-456-2000 Code of practice of plain and Reinforced concrete.
2. Design of Reinforced concrete structure by P.Dayaratnam, Oxford IBM publication, New Delhi
3. Reinforced concrete Design by S.N.Sinha, Tata McGraw Hill New Delhi

01 1X18 ENVIRONMENTAL ENGINEERING-I

L-T-P: 3-0-3

Credit : 5

Theory:

- 1. Water quantity demand,** Design period; population forecast, variation of quantity of water, sources of water: ground and surface, Intakes. **Lecture : 7**
- 2. Water quality** physical chemical and biological parameters: Examination of physical, chemical and biological characteristics of water. **Lecture: 5**
- 3. Water purification:** philosophy of treatment. Unit operations and processes, Design of physical chemical and biological processes: Plain sedimentation, Coagulation and flocculation. **Lecture : 7**
- 4. Filtration:** Slow and rapid sand filters: disinfection. Softening, adsorption and reverse osmosis and other treatment method. **Lecture : 8**
- 5. Water Storage:** Pumping Transportation of water; Water distribution systems and analysis' Appurtenances of water transport and distribution systems, Hardy-Cross method of analysis. **Lecture : 9**
- 6. Introduction** to air noise pollution **Lecture : 6**

Text Books:

1. Environmental Engineering by Peavy H. S, Rowe D.R. and Tchobanoglous G. Tata McGraw Hills, New Delhi.
2. Introduction to Environmental Engineering & Science 2nd Ed. by Gilbert M. Masters. Prentice Hall. New Jersey.

Reference Books:

1. Elements of Water Supply and Wastewater Disposal by G.M Fair. J.C.Geyer. D.A. Okan, John Wiley and Sons Inc
2. Water Supply and Sewerage by Terence, J McGhee, McGraw Hill Book Co.
3. Water and Waste Water Technology by M.J. Hammer, John Wiley and Sons. New York
4. CPHEEO Manual on water supply and treatment, Ministry of Urban Development.
5. Environmental Management by GN Pandey ,Publishing House Pvt. Ltd

Practical:

Environmental Chemical Analysis of Water for different Parameter; Visit to a Water W. W. Treatment Plant.

01 1X19 TRANSPORTATION ENGINEERING - I

L-T-P: 3-0-3

Credit : 5

Theory:

- 1. Introduction :** Importance of transportation, Different modes of transportation. Characteristic of road transport, importance of roads in India, Scope of Highway Engineering, Classification of roads and road patterns, recently launched highway projects in India. **Lecture : 3**
- 2. Traffic Engineering :** Traffic Characteristic, Traffic Operation, Elements of Design of Intersections. **Lecture : 6**
- 3. Highway Geometric Design :** Introduction, Highway cross- section elements, sight distance, Design of Horizontal Alignment, Design of Vertical alignment, IRC Specifications. **Lecture : 12**
- 4. Highway Materials :** Sub-grade soil, Stone aggregate, Binding material (Bitumen emulsion tar and cut back), modification binders, use of Geo- textiles and Geo- grids, MORT specs, SUPERPAVE **Lecture: 6**
- 5. Design of highway Pavements :** Function and desirable characteristics of pavements, pavements course, Pavements types, comparison of rigid and flexible pavement, pavement components, IRC and AASHTO methods. **Lecture : 8**
- 6. Highway construction :** WBM, WMM, BM, BMM, PC, AC, Mastic Asphalt , BSG, PM, Seal Coat , BSD, Prime coat, Track coat, Highway maintenance and pavement Evaluation highway drainage. **Lecture : 10**

Text Books :

- Highway Engineering by Khanna, S.K. and Justo, S.E.G., Nemchand Bros., Roorkee.
- Principle and design of pavements by Kadiyali, L. R., Khanna Publishers, New Delhi

Reference Books:

- Highway Engineering by Wright, P.H., John Wiley and sons, New York
- An Introduction to Transportation Engineering and planning by Morlok, E.R., McGraw Hill, Kagakusha international student Education.
- Introduction to Transportation Engineering by Hay. W.W., John Wiley and sons, New York.
- Fundamental of Transportation Engineering by Papacostas, C. S., Prentice hall of India, New Delhi
- Pavement analysis and Design by Huang, Y. H., Prentice Hall, Englewood Cliffs, New Jersey.

Practical:

- 1. Test on Road Aggregates**
 - Aggregate Crushing value test
 - Abrasion test
 - Aggregate Impact test
 - Specific gravity and water absorption test
 - Shape test (Elongation and Flakiness)
 - Stripping value of road aggregate
- 2. Tests on Bitumen**
 - Penetration test
 - Softening point test
 - Specific gravity test
 - Viscosity test

01 1X20 DESIGN OF STEEL STRUCTURES

L-T-P:2-0-2

Credit : 4

- 1. Introduction to Design :** Design Loads and Load combinations, Working Stress Design, Plastic Design, LRFD Method, Introduction to steel and steel structures. **Lecture : 4**
- 2. Design of structural Fasteners :** rivets, bolts and welds. **Lecture : 6**
- 3. Design of tension members.** **Lecture : 4**
- 4. Design of compression member,** laced and battened columns. **Lecture : 6**
- 5. Design of flexure members :** Beams- rolled sections, built up section, plate Girders- riveted/ bolted and welded, Design of eccentric connections: riveted/ bolted and welded. **Lecture : 8**
- 6. Design of beam :** Columns and columns based welded and riveted column bases- moment resistant connection - semi rigid connection- design of supports. **Lecture : 5**
- 7. Design of steel industrial sheds.** Wind Design. **Lecture : 8**
- 8. Introduction** inelastic action and plastic hinges application of PD and LRFD. **Lecture : 3**

Text Books:

- Design of steel Structure by A.S Arya and J.I. Ajmani, Nemchand Bros.
- Design of steel Structure by S.M.A. Kazimi and R.S. Jindal, Prentice Hall (India) New Delhi
- Design of steel Structures by S.K.Duggal, Tata McGraw Hill, New Delhi

Practical/Sessional :

Based upon theory Classes

01 1x21 CIVIL ENGINEERING PROFESSION & PRACTICE

L-T-P : 0-0-3

Credit : 2

Introduction lectures, demonstrations, field visits on activities of department and the civil engineering profession & Ethics.

01 1x22 FOUNDATION ENGINEERING

L-T-P : 3-0-0

Credit : 3

THEORY:

1. **Explorations**, Geographical Investigation, Characterization of ground, site investigations, method of drilling, sampling. **Lecture : 4**
2. **Bearing Capacity**, general, local and punching shear failures, correction for size, shape, depth, water table, eccentricity, ultimate and allowable Bearing capacities, Effect of ground water level. **Lecture: 05**
3. **In-situ tests** : SPT, CPT, plates load tests, methods for ultimate bearing capacity based on in situ tests. **Lecture: 03**
4. **Settlement of foundations:** **Lecture: 03**
5. **Pile foundation** : Introduction, Pile classification, Pile installation, cast in sine pile, Driven pile, load carrying capacity of pile by static and dynamic methods, Pile load test, Pile groups, laterally loaded piles. **Lecture: 08**
6. **Caisson and Well Foundation**:- Types of Caisson, Components of Well foundation, Stability analysis of well foundation, Tilt. and Shift. **Lecture: 05**
7. **Expansive Soils** : Identification, swelling pressure, Foundation on expansive soil, Stabilization of expansive soils. **Lecture: 05**
8. **Bridge foundations caissons**, coffer dams. Excavation and dewatering for foundation. Failures and strengthening, Foundations on weak soils, reclaimed areas, swelling soils and foundations on expansive soils, arching in soil. **Lecture : 5**
9. **Machine foundations** : Types, Basic definitions. Degree of Freedom of a Block foundation, General criteria for design of machine foundation, 'Free and forced Vibrations and machine foundations subjected in impact loads. **Lecture : 9**

Text Books:

1. A Text book of soil Mechanics and foundation Engineering, Revised and enlarged 4th edition, 1993. by V.N.S. Murthy, Saikripa Technical Consultants, Bangalore.
2. Basic and Applied soil Mechanics by Gopal Ranjan and A.S.R.Rao, Wiley Eastern Ltd. New Delhi 1992.

Reference Books:

1. Foundation Engineering by R.B. Peck, W. E. Hanson and T. H. Thournburn, John Wiley, New York.
2. Foundation analysis Design by J.E. Bowles, McGraw Hill Book co. New York.
3. Foundation Engineering by G.A.Leonard, McGraw Hill Book co. New York.
4. Engineering Principle of Ground Modification by M.R.Hausmann, McGraw Hill International edition, New York.

01 1X23 ENVIRONMENTAL ENGINEERING - II

L-T-P : 3-0-3

Credit : 3

Theory:

1. **Generation and collection of waste-water**, sanitary, storm and combined sewerage systems, Quantities of sanitary wastes and storm water, Design of sewerage system. **Lecture : 7**
2. **Physical, Chemical and Biological characteristics** of waste-water, Primary, Secondary and Tertiary treatment of waste-water. Wastewater; Wastewater Disposal Standards **Lecture : 4**
3. **Basic of microbiology Biological** : Wastewater treatment systems : BDO, Kinetics, Kinetics and Design of Aerobic Processes- Activated sludge process and its modifications. Trickling filter, RBC, Oxidation ponds and Aerated Lagoons. **Lecture : 10**
4. **Anaerobic process** : conventional anaerobic digester, High rate and Hybrid anaerobic reactors, Sludge digestion and handling, Septic tanks, Disposal of effluent and sludge. **Lecture: 9**
5. **Simple design problems** on sewerage, waste-water treatment unit and sludge digestion. **Lecture : 4**
6. **Introduction** to Municipal solid Waste Management's **Lecture : 4**

Text Books :

1. Waste water Engineering Treatment and Reuse by Metcalf & Eddy, TMH Publication.

Reference Books :

1. Elements of water supply and waste-water Disposal by G.M.Fair. J.C.Geyer, D.A.Okan, John Wiley and Sons Inc.
2. Water supply and sewage by Terence, J. McGhee, McGraw Hill Book Co.
3. Water and Waste Water Technology by M.C.Hammer, John Wiley and sons, New York.
4. CPHEEO: Manual on sewerage and Sewage Treatment, Ministry of Work and Housing New Delhi.

01 1X24 TRANSPORTATION ENGINEERING - II

L-T-P: 3-0-0

Credit : 3

Theory:

1. **Railway Engineering** :Role of railway in transportation system, railway and highways, comparisons.
2. **Permanent ways** : Alignment and grade, cross section and its elements, gauges, grade compensation and widening of gauges on curves, coning of wheels and traction resistance.

Lecture: 4

3. **Single and Interlocking**, Points and crossing, station and yards.

Lecture : 10

Lecture : 10

4. Introduction to Bridge Engineering:

- 4.1 Introduction, type of bridge and culvert and their suitability, site selection.
- 4.2 Determination of scour depth, depth of foundation, linear waterway Economic span, Afflux, Freeboard, clearance.
- 4.3 Load forces and stresses in bridge structures, IRC loading.
- 4.4 Type of bridge : Super structures flooring and their choice, Details of bearings and joints in Bridge super structure.

- 4.5 Type of bridge foundation – spread, raft, well and caissons, sinking of well foundations (design excluded, Method of erection of bridges.

Lecture 10

5. **Introduction** to Airports.

Lecture : 08

Text\ Reference Books:

1. An introduction to Transportation, Engineering and Planning by Morlok, E. R., McGraw Hill Kagakusha International Student Edition.
2. Traffic Engineering and Transportation Planning by Kadiyali, L. R., Khanna Publishers, New Delhi.
3. Introduction to Transportation Engineering by Hay, W. W., John Wiley and sons, New York.
4. Fundamentals of Transportation Engineering by Papacostas, C.S. Prentice Hall of India, New Delhi.
5. Principles of Urban transportation Planning by Hutchinson, B. G., McGraw Hill Book company.
6. A text Book of Railway Engineering by Saxena, S.C.Arora, S. P., Dhanpat Rai & Sons< New Delhi.
7. Railway Track Engineering by Munday, J. S., Tata McGraw Hill, New Delhi.
8. Indian Railway Track by Agarwal, M. M., Sachdeva press, Mayapuri, New Delhi.
9. Railroad Engineering by Hay, W .W. John Wiley and sons, New York. Delhi

01 1x 25 DESIGNS OF HYDRAULIC STRUCTURES

L-T-P : 3-0-3

Credit : 5

Theory:

1. **DESIGN & MAINTENANCE OF CANALS**: Design of canal based on tractive force approach, Maintenance of unlined channels (Based on IS 4839 – 1979 part – I), Maintenance of lined channels (Based on IS 4339 – 1979 part – II).

Lecture : 5

2. **DESIGN OF CANAL OUTLETS.**

Lecture : 3

3. CANAL HEADWORKS

- Selection of site for storage & diversion head works
- Weir or Barrages
- Divide wall, Scouring sluice or under sluices, fish ladder.

Lecture : 5

4. DAMS

- Gravity dams, earth & rock fill dams, buttress dams & arch dams.
- Spillways & outlet works

Lecture : 10

5. CANAL REGULATION WORKS

- Head Regulator, Distributary head regulator, Cross regulators
- Necessity of channel falls, types of falls & design of vertical drop fall/Sharda type falls

Lecture : 10

6. CROSS – DRAINAGE WORKS

- Types of C – D works: Aqueducts, siphon Aqueducts, Super passages, Siphon Super passages, level crossings, Inlet & Outlet.

- Fluming of channels & design of channel transitions.

Lecture : 5

7. An introduction to river basis development.

Lecture : 4

Text Books :

1. Fundamental of Irrigation Engineering by Bharat Singh, Nemchand Bros., Roorkee, Uttarakhand.
2. Irrigation & Water Power Engineering by Punima B.C., Pande Lal B.B., Laxmi Publication Pvt. Ltd. New Delhi.
3. Water Resource Engineering by Garg S.K., Khanna Publishers, New Delhi.
4. Water Power Engineering by Dandekar MM/ Sharma KN, Vikash Publishing Pvt. Ltd

Reference Books :

1. Water Resources Engineering by R.K. Linsley & J.L.H. Paulhus, McGraw Hill.
2. Hydroelectric Handbooks by W.P. Creager & J.D. Justin, John Wiley & Sons.

PRACTICAL/SESSIONAL:

Design problem based on theory classes.

01 1X26 DESIGN OF CONCRETE STRUCTURES – II

L-T-P : 3-0-3

Credit : 5

Theory :

1. **Design** of RCC water tanks, solos, bunkers and simple bridges. **Lecture : 14**
2. **Design** of residential buildings. **Lecture : 14**
3. **Design** of arches and shells. **Lecture : 14**

Text/ Reference Books:

1. Plain and Reinforced Concrete, Vol. I and II. by J. Krishna and O. P. Jain, Nemchand Bros. Roorkee.
2. IS 456, 2000. Code of Practice for Plain and Reinforced concrete.
3. Design Aids for R.C. to IS 456-2000.
4. Design of Reinforced Concrete Structures by P. Dayaratnam, Oxford- IBM Publishing Co., New Delhi.

Practical/Sessional:

Complete design and drawing of two complete projects such as a residential building, a bridge, a stadium, elevated water tank, bunker, silo and shell roof.

01 1X27 CONSTRUCTION PLANNING AND MANAGEMENT L-T-P : 3-0-0

Credit : 3

Theory:

1. **Construction and fabrication methods** : Pre- fabrication techniques; choice of equipment safety features and Regulations. **Lecture : 8**
2. **Value Analysis**, Feasibility studies; Economics of project evaluation: Finance, material and manpower development. **Lecture : 8**
3. **Network analysis**, PERT : Leveling of Resources. **Lecture : 8**
4. **Site organization** : layout: work study: Decision making processes: CPM and L. P. Project monitoring. **Lecture : 10**
5. **Maintenance management** : Case studies. **Lecture : 6**
6. **Introduction** to Project Management Software. **Lecture : 5**

Text Book:

1. Construction Planning and Management by U. K. Srivastav.

01 1X28 CONTRACTS, SPECIFICATION AND ESTIMATION

L- T- P : 0-0-3

Credit : 2

Practical/Sessional :

Contracts : Types, item rate contract, Percentage rate contract, Contract for supply of materials, Lump-sum contract. Labour rate contract, Negotiated contract and Piece work agreement.

Tenders : Earnest money. Work order, Informal tender, Security deposit, Liquidated damages, Contract Documents, Awarding and termination of contract, Maintenance period of contract, Refund of security deposit.

Measurement and Payment : Intermediate and running payment. Final payment, Measurement completed work, Measurement book, Loss of measurement book.

Specifications : Introduction, Object of specification, Types, General specification of buildings.

Specification of Materials : Bricks, Cement, Sand, Water, Lime and Reinforcement, Quantity surveying and estimating, Analysis of rates. The evaluation will be based upon submission of a partial or complete estimate of a project.

Text Books :

1. Estimating and Costing by B. N. Dutta, Tagore Palli, Lucknow.
2. Quantity surveying by, P. L. Basin, S. Chand and Company, Delhi.
3. Building Construction and Estimating by G. H. Cooper. McGraw-Hill.
4. Construction Project Scheduling and Control, 2nd Edition by Saleh Mubarak , Wiley

01 1X30 FINITE ELEMENT METHODS

L-T-P : 3-0-0

Credit : 3

Theory:

Principles of discretization, Element stiffness mass formulation based on direct, variational and weighted residual techniques and displacements, hybrid stress and mixed approaches, shape functions and numerical integrations. Convergence, displacement formulations for rectangular, triangular and isoparametric elements for two dimensional and axis symmetric stress analysis; thin and thick plates and shells: Semianalytical formulations. Three dimensional elements and degenerated forms. Stiffener elements and modifications such as use of different coordinate systems, use of nonconforming modes and penalty functions.

Text Books:

1. The Finite Element Method by O. C. Zienkiewicz, Tata McGraw Hill.
2. Numerical Methods in Finite Element Method Analysis by Wilson, E. L. And Bathe, K. J., Prentice Hall Englewood Cliffs.

01 1X31 COMPUTER AIDED DESIGN

L-T-P: 3-0-0

Credit : 3

Theory:

Engineering design principles, interactive design using workstations, and software tools. Computer graphics. Introduction to GKS. Starnase :onraroes. Computer aided design and drafting, data base management system, simulation and optimization. Applications in Civil Engineering, structural design.

01 1X32 WATER AND LAND MANAGEMENT

L-T-P: 3-0-0

Credit : 3

Theory:

1. **Problems of irrigation systems in India**, Soil and Land Irrigability classification, Basic concepts of diagnostic analysis. **Lecture : 3**
2. **Soil, Water Plant Relationship**, Evapotranspiration, crop coefficient, effective rainfall, crop water requirements, irrigation efficiencies. **Lecture : 10**
3. **Irrigation scheduling**, Stressed irrigation, drought and water management policy during drought. **Lecture : 4**
4. **Micro level Planning** for any canal/tube well system, Evaluation of chak planning and design. **Lecture : 3**
5. **Water application methods** : Border irrigation, basin irrigation, furrow irrigation, sprinkler and drip irrigation. **Lecture : 3**

- 6. Operation and maintenance of irrigation system** : rotational water distribution systems- arabandi. Evaluation of irrigation project's performance and improvement. **Lectures : 5**
- 7. Design of an on farm drainage system**, surface drains, sub- surface drains, mole drains and bio-drains: outfall condition, salinity and alkalinity control, operation and maintenance of a drainage system. **Lecture : 6**
- 8. Evaluation and status of land development** in irrigated commands, Norms of land leveling, methods of land leveling. Plane method or centroid method, contour adjustment method. **Lecture : 5**
- 9. Irrigation behaviour and decision making**, Attitudes and their influence on irrigation management, night irrigation, participatory irrigation management, irrigation organizations. **Lecture : 5**

Text Books:

1. Irrigation Theory and Practice by A. M. Michael, Vikas, Pub., New Delhi.
2. FAO Irrigation and Drainage Paper no. 24 & 58, Rome, Italy.
3. Irrigation Engineering by G. L. Aswa, Wiley Eastern, New Delhi.
4. Irrigation Engineering by S. K. Mazumdar, Tata McGraw Hill Pub., New Delhi.

Reference Books :

1. Diagnostic Analysis of Minor irrigation scheme, Publication no. 11, WALMI, Aurangabad (Maharashtra).
2. Application of soil survey in Irrigation Water Management, Publication no. 21, WALMI, Aurangabad (Maharashtra).
3. Irrigation : Gravity Methods and Efficiencies, Publication no. 15. WALMI, Aurangabad (Maharashtra).

01 1X33 AIR POLLUTION ENGINEERING

L-T-P: 3-0-0

Credit : 3

Theory:

1. **Air pollutants**, Sources, Classification. **Lecture : 3**
2. **Combustion** Processes and pollutant emission. **Lecture : 4**
3. **Effects on Health**, vegetation, materials and atmosphere. **Lecture : 4**
4. **Reactions of pollutants** in the atmosphere and their effects- Smoke, smog and ozone layer disturbance etc. **Lecture : 8**
5. **Atmospheric diffusion** of pollutants and their analysis. Transport, transformation and deposition of air contaminants on a global scale. **Lecture : 8**
6. **Air Sampling** and pollution measurement methods, principles and instruments, Ambient air quality and emission standards. **Lecture : 5**
7. **Control principles**, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate emission control, settling chambers, cyclone separation. Wet collectors, fabric filters, electrostatic precipitators and other removal methods. **Lecture : 10**

Reference Books:

1. Air Pollution by Rao & Rao, TMH.
2. Air Pollution Control Engineering by Rao, TMH.

01 1X34 AIRPORT PLANNING AND DESIGN

L- T- P: 3-0-0

Credit : 3

Theory:

1. **Aircraft characteristics** related to airport design.
2. **Airport configuration** : runway configurations, relation of terminal area to runway orientation, Geometric Design of the airfield - ICAO and FAA design standards, runways, taxiways.
3. **Holding aprons and aprons** : Planning and design of the terminal area- apron – gate system, size and number of gates, aircraft parking configurations, the passenger terminal system.
4. **Airport lighting and marking** : air traffic control, airport planning and air travel demand forecasting; Structural design of airfield pavements.

01 1x35 RIVER HYDRAULICS AND SEDIMENT TRANSPORT

L-T-P : 3-0-0

Credit : 3

Theory:

1. **River morphology** types and stages of river, phenomenon of floods, flood damages, means of flood control, river training works, groynes and spurs, embankments, cut-offs and river control structures.
2. **Sediment transport principle**, mechanics of aggradation and degradation, of river beds and bank erosion, Bed load, suspended load and total load, River measurement, gauge discharge and sediment.

Text Books:

1. Mechanics of Sediment Transport and Alluvium Stream Problems by R. J. Grade and K. G. Rangaraju, Wiley Eastern Ltd., New Delhi.
2. Manual of River Behaviors, Control and Training by D. V. Joglekar, CBIP, Pub., No. 60, 1971.
3. Irrigation Engg. by G. L. Aswa, New Agro Int. (P) Ltd. Pub., New Delhi.
4. River Engg. by M.S. Peterson, PHI, New Delhi

01 1x36 CIVIL ENGINEERING DRAWING USING AUTOCAD**L-T-P: 3-0-0****Credit : 3****Theory: Introduction to Auto Cad :**

Loading and configuring AutoCAD. Creating viewing and editing the drawing in Auto Cad, Different compound entries, From Table menu, From bottom menu, Data entries, Absolute coordinates, Relative and Polar coordinates, World coordinates, Pointing with key boards, object snap etc. Advanced user Interfaces. Menu bar and pull Down menus Icon menu dialogue Boxes, Utility, Commands, All the available commands in Auto Cad, Edit and Enquiry Commands, Display Controls, Dimensioning and crosshatching, Exercise 3 Nos. Plotting, Sessional Examinations.

01 1X37 STRUCTURAL DYNAMICS**L-T-P: 3-0-0****Credit : 3****Theory:**

Formulation and solution of SDOF and MDOF dynamics systems; Undamped and Damped systems; Free and Forced vibration; Duhamel's integration; Dynamic load factor; Modal Analysis; Continuous systems, Axial and transverse vibration of beams. Vibrations of plates; support motion; Energy Principles and Hamilton's Equations; Introduction random vibration.

Text Book

1. Dynamics of Structures by Patrick Paultre, Wiely
2. Dynamics of Structures by Clough & Penzine , MC- Graw- Hill

01 1X38 SOLID WASTE MANAGEMENT**L-T-P: 3-0-0****Credit : 3****Theory:**

Solid wastes-Sources, nature and characteristics of municipal solid waste, Quantities and qualities, Rates of generation and factors affecting them, Potential of diseases, nuisances and other problems due to solid waste management, Solid wastes management-Generation, on-site storage, collection, separation, processing and disposal On-site storage methods-containers, their type, size and location, Collection systems-Vehicles, routing, route balancing and transfer stations , Processing methods, recovery and reuse of materials and energy, Disposal methods such as sanitary landfill biological digestion etc. Industrial and hazardous solid waste management, Urban solid waste management and its modeling.

01 1X39 TRAFFIC ENGINEERING**L-T-P: 3-0-0****Credit : 3**

Theory: Introduction, Traffic survey speed, Journey and Delay Surveys, Vehicles Volume counts, O-D survey. Use of Photographic Technique in Traffic survey, Elements of Parking survey Analysis and Interpretation of Traffic Studied Statistical Methods of Traffic Engineering, Speed studies, Traffic forecasting Traffic Controls; Traffic signs, Road marking , Traffic signals Highway capacity analysis for rural roads and urban roads Traffic Regulations, Regulation of traffic, Design of controlled and uncontrolled intersections Traffic safety; Road accidents , Causes and Prevention, Street Lighting and Traffic management.

01 1X40 DESIGN OF WATER RETAINING, PLATE AND SHELL STRUCTURES**L-T-P: 3-0-0****Credit : 3**

Theory: Pure bending of plates; Symmetric bending of circular plates; small deflection of laterally load plates; Rectangular plates with various edge conditions; Continuous rectangular plates; Plates of various shapes; Application for water tanks, Shell as space enclosure, geometry, classification, principal and Gauss curvature; General Theory of thin elastic shells; Shallow and high rise shells; Circular long and short cylindrical shells, beam-arch approximation for long shells; shells of double curvature, surfaces of revolution and translation; Circular, elliptical hyperbolic paraboloids, conoids and funicular shells-membrane and approximate bending theories; Closed form and numerical method of analysis of Synclastic and Anticlastic shells.

01 1X41 INDUSTRIAL WASTE TREATMENT

L-T-P: 3-0-0

Credit : 3

Theory:

Industrial waste waters nature and effects, Water pollution and problem pollutants, stream sanitation, deoxy-generation and self purification in streams, sources and characteristics of industrial waste-waters, sampling and analysis, in-plant waste control and water reuse, different methods of treatment, aeration, sedimentation, combined biological, physical and chemical process, application of treatment method to some selected industry, introduction to ISO:14,000, life cycle analysis etc.

01 1X42 TRANSPORTATION SYSTEM AND PLANNING

L-T-P : 3-0-0

Credit : 3

Theory:

Introduction to Transportation planning process, Transportation Surveys, Models for Trip Generation, Trip Distribution, Traffic Assignment and modal split, Network Analysis, Shortest path Algorithms, Minimum Tree, Land-use Transport Models, Calibration of Transportation Models, Economic Evaluation of Transportation plans, Facility Location Problems, vehicle Operating Costs.

Text Books :

1. Regional Development Planning in India by Prakash Rao and Sundaram, Vikas Publishing House.
2. Urban Transportation Systems Planning by B.G.Hutchinson, Introduction to McGraw Hill.
3. Urban Public Transportation Systems and Technology by Vukan R. Vuchin, Prentice Hall Inc.,N.J.
4. Public Transportation Planning Operations and Management by G.E. Gray and L.A. Hoel, Prentice Hall Inc.

01 1X43 WATER RESOURCES PLANNING AND MANAGEMENT

L-T-P : 3-0-0

Credit: 3

Theory:

Purpose and scope of water resources development, water resources of world and Asian continent , water resources potential and utilization in India, turns boundary features, functions of water in land development and social planning, integrated river basin development; water supply and demand assessment, types of consumptive and non-consumptive uses of water resources ; single and multipurpose water users-compatibility of different uses; allocation of available water resources , Reservoir planning, Systems concept in engineering , system analysis , optimization techniques, linear programming, dynamic programming, water resources planning, and project formulation, economics of water resources development; conjunctive use; interstate and international issues, environmental impact.

Text Books :

1. Water Resources Engineering by R.K.Linsley and J.B.Franzini, McGraw Hill Book Co.,New York.
2. Water Resources System Planning & Economics by R.S. Varshney, Nem Chand, Bros. Roorkee.
3. Water Resources Systems Engg. by W.A. Hall and J.C. Dracup, McGraw Hill Book Co., New York.
4. Water Resources Engineering by Larry W. Mays , Wiely

01 1X44 SOIL DYNAMICS

L-T-P : 3-0-0

Credit : 3

Theory :

Principles of dynamics and vibration, Single degree and Multiple degree of freedom systems- free and forced vibrations, Dampening and Soil Spring Constants, Introduction to vibration of continuous systems – wave propagation in soil media, Laboratory and In-situ determination of dynamic soil properties, Introduction to machine foundations and its practical considerations for construction IS code of practice, Examples, Soil Liquefaction.

Text Book :

1. Handbook of Machine Foundations by Srinivasulu and Vidyanathan, TMH, New Delhi.

01 1X45 ADVANCED FOUNDATION ENGINEERING**L-T-P : 3-0-0****Credit : 3****Theory:**

Conventional method of Design of Isolated footings, Strip footings, Raft foundations, Piled Raft foundations, Well foundations, Floating foundations. Determination of pile capacities, negative skin friction and group action of piles considering stress-strain characteristics of real soils, Deep open cuts, Cofferdams, Batter piles, Anchor piles and determination of pull out resistance, Legal aspects of problems in Foundation Engineering.

Critical study of nature and complexities of soil structure interaction; Application of advanced techniques of analysis such as the finite element method, finite differences, relaxation and interaction for the evaluation of soil-structure interaction for different types of structures under various conditions of loading and subsoil characteristics; Preparation of comprehensive design oriented computer programmes for specific problems. Interaction problems based on the theory of sub grade reaction such as beams, footing, rafts, bulkheads etc., Legal Aspects of problems in Foundation Engineering.

Text Books:

1. Analytical and computer method in foundation by J.E. Bowels, McGraw Hill Books Co., New York.
2. Numerical Methods in Geotechnical Engineering by C.S. Desai and J.T. Cristian, McGraw-Hill Book Co., New York.

01 1X46 WATER POWER ENGINEERING**L-T-P : 3-0-0****Credit : 3****Theory :**

Comparison of hydro-power and thermal power, combined power systems and grids, assessment of available hydropower, necessity of storage and pondage, flow duration curve and their uses, types of hydropower plant, design of power house structures; intakes, conveyance systems, forebay, surge tanks, power house, tail race, types and selection of turbines, water hammer analysis.

Text Books :

1. Water Power Engg. by M.M Dandekar and K.N. Sharma, Vikas Publishing house, New Delhi.
2. Hydropower Structures by R.S. Varshney, Nem Chand and Bros., Roorkee.

01 1X47 BRIDGE ENGINEERING**L-T-P : 3-0-0****Credit : 3****Theory :**

Brief historical review, Different types of Bridges and span range, Bridge codes, Bridge super structures- Reinforced concrete slab bridge deck, Plate girder bridges, Composite bridges, prestressed concrete bridges, Steel trussed bridges; Orthotropic plate theory, Determination of rigidity parameters, Load distribution in different girders – Courbon's method, Morice-Little method, Box girder bridges – finite element and finite strip analysis, finite difference analysis of deck slab, grillage analysis, Cable stayed and suspension bridges; Bridge construction; Bridge maintenance.

Reference/Text Books:

1. Bridge Engineering by Vector et. al., TMH.

01 1X48 SYSTEMS ENGINEERING**L-T-P : 3-0-0****Credit : 3****Theory :**

Introduction to the course and its importance, Optimization methods:-Introduction, Problem formulation, Introduction to mathematical principles in optimization, Solution techniques for linear and integer problems Introduction to non-linear problems, simplex and dual simplex methods, Civil Engineering Case Studies, Transportation Model, Degeneracy and dual simplex methods, civil engineering case studies. Transportation model. Degeneracy and assignment problem, Project scheduling, queuing system and their characteristics, PERT & CPM, inventory and crew scheduling.

01 1X49 ENVIRONMENTAL IMPACT ASSESSMENT

L-T-P : 3-0-0

Credit : 3

Theory :

Technical and procedural aspect of Environmental impact assessment, Guidelines and aspects of environmental protection, Determination of Baseline environment, General framework for characterizing environmental dislocation/disruption due to pollution, application of mathematical models for water quality systems, Stream and Estuarine models for pollution control. Socio-economic aspects, measures effectiveness of pollution control activities, various method of total impact assessment, Environmental auditing.

Text books :

1. Environmental Impact Assessment by Canter, McGraw Hill Inc.,

01 1X50 PRE-STRESSED CONCRETE DESIGN

L-T-P : 3-0-0

Credit : 3

Theory :

Concept on mechanics; materials; properties of section; stress analysis- three methods: prestressing and post stressing; Beam design – no tension and ultimate; Poles and slab panels; Loss assessment; Composite beams; Design for shear. Large span structure; Structural forms and design principles; Special material, open web and built-up structures.

01 1X51 DESIGN OF DAMS

L-T-P : 3-0-0

Credit : 3

Theory:

Gravity on Mechanics, Buttress dams, Rock fill dams; Application of analogy techniques; Spillways techniques, classification, design considerations; Contraction joints, treatment of foundations, design of hydropower installation and intake structures.

01 1X52 IRRIGATION ENGINEERING

L-T-P : 3-0-0

Credit : 3

1. **Irrigation Principles and Practices** : Introduction. Necessity, Advantages and disadvantages of irrigation, classification, method Irrigation. **Lecture : 5**
2. **Soil water plant and Their Relationship** : Soil Classification, Soil- water plant relation , soil moisture relationship, Water Requirement of Crops; Optimum Use of water, Factors affecting water requirement of crops, Duty, Delta; and their relationship. Water Requirement by inductive methods, Critical Coefficients Consumptive use of requirement by climatologically approach, FAO methods for Reference evapotranspiration **Lecture : 12**
3. **Irrigation Efficiencies.** **Lecture : 3**
4. **Irrigation Scheduling** : for both Irrigated dry and irrigated wet crops, irrigation scheduling in command areas. **Lecture : 4**
5. **Flow Irrigation** : Classification of canals, Canals alignments, Components of permanent canal system, Canal capacity, canal losses, Lined channels & their design, Kennedy's slit theory and design of channels on its basis, Lacey's slit theory and regime equations, various types of relations, Design of channels based on Lacey's equation. **Lecture : 12**
6. **LIFT IRRIGATION** : Classification, Location, Water lifting arrangement, Yield of wells. **Lecture : 6**

Text Books :

1. Fundamental of Irrigation Engineering by Bharat Singh, Nemchand Bros., Roorkee, Uttarakhand.
2. Irrigation & Water Power Engineering by Punima B.C., Pande Lal B.B., Laxmi Publication Pvt. Ltd. New Delhi.
3. Water Resource Engineering by Garg S.K., Khanna Publishers, New Delhi.
4. Irrigation Theory & Practice by Micheal A.M., Vikas Publication, New Delhi.

Reference Book :

1. Water Resources Engineering by R.K. Linsley & J.L.H. Paulhus, McGraw Hill.

01 1x53 LAND DRAINAGE

L-T-P : 3-0-0

Credit : 3

1. **INTRODUCTION** : Forms and nature of occurrence of watering soils – Soil moisture characteristic, Darcy's law & Richards equation – Soil water movement above water level. **Lecture : 3**
2. **AGRICULTURE DRAINAGE** : Needs for drainage – Drainage and crop production, drainage to control water logging & salinity. **Lecture : 2**

3. **DRAINAGE SYSTEMS** : Components of a drainage system, Field drainage system (i) Surface drainage system, (ii) sub surface drainage systems and (iii) Compound drainage systems. **Lecture : 3**

4. **DRAINAGE INVESTIGATIONS**: Water table dissolves salts in ground water, hydraulic conductivity, depth of impermeable layer, hydraulic conductivity, drainage coefficient, flow at the junction of two drains.

Lecture : 10

5. **SURFACE DRAINS**: hydraulic design of a surface drains and its related structures, construction and maintenance of surface drain's. **Lecture : 4**

6. **SUBSURFACE DRAINS**: Types – design of depth of subsurface drains, design of spacing of subsurface drains (i) for steady state condition (ii) for unsteady state condition – diameter of pipe drains, grade of pipe drains, design of envelop, construction and maintenance, economics of subsurface drains. **Lecture : 12**

7. **SOIL SALINITY**: definitions, saline, alkaline and saline, alkali soils, drainage for salinity control, land reclamation techniques for salt affected soils. **Lecture : 8**

Text Books:

1. Drainage Manual "US Department of the interior", Bureau off reclamation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

2. Drainage Principles & Application, International Institute Land Reclamation & improvement, Wageningen, The Netherlands publication.

3. Drainage Engineering by J.N. Luthin, John Wiley & Sons, New York, USA.

Reference Books:

1. Diagnosis & Improvement of saline & alkali soil, Agriculture Hand book no 60, US Deptt. of Agriculture.

2. Hand book of Drainage of Irrigated areas in India, LBII/WAPCOS (India) Ltd., Technical Report no. 5, New Delhi.

3. Hand book of Irrigation Technology, VOL II, Hermah J. Finkel, CRC Press.

01 1x54 FLOODS & DROUGHTS

L-T-P: 3-0-0

Credit : 3

1. FLOODS

- Introduction
- Rational Method
- Empirical Formulae
- Unit Hydrograph Method
- Flood Frequency Studies
- Gumbel's Method
- Log Pearson Type III Distribution
- Partial Duration Series
- Regional Flood Frequency Analysis
- Limitations of Frequency Studies
- Design Flood
- Design Storm

Lecture : 12

2. FLOOD ROUTING

- Introduction
- Basic equations
- Hydrologic storage routing
- Attenuation
- Hydrologic channel routing
- Hydraulic method of flood routing
- Routing in conceptual hydrograph development
- Clark's method for IUH
- Flood control
- Flood forecasting
- Flood control in India with special reference to Bihar

Lecture : 15

3. FLOOD MANAGEMENT TECHNIQUES

Introduction Flood Control and Management-Catchment Area treatment- Structural Measures- Non- structural Measures.

Lecture : 5

4. DROUGHTS

- **Climatic Regions**
 - Arid region
 - Semi-arid region
 - Humid regions
- **Drought**
 - Drought and rainfall
 - Drought classification
 - Drought, rainfall and temperature
- **Effects of drought**
 - Effects on ground water
 - Effects on water quality
 - Effects on socio economic status
- **Drought Control**
 - Supply oriented drought control measures
 - Demand oriented drought control measures.

Text Books :

1. Engineering Hydrology by Muteraja.
2. Engineering Hydrology by Subramaniam
3. Watershed Hydrology by R. Suresh, Standard.

01 1X55 GROUND WATER ENGINEERING

L- T- P : 3-0-0

Credit : 3

1. **Introduction** : Ground water development in India. Characteristics of fluid and the Medium. Soil moisture, Classification of subsurface water, Darcy's law, Range of validity of Darcy's law, Co-efficient of permeability.
2. **General Hydro- dynamical Equations** for the flow of Fluids through Porous media. The Equation of continuity, Equation of motion, Dupuit's equations for unconfined seepage flow, Plane free surface flow with horizontal impervious base without infiltration. Plane free surface flow with horizontal impervious boundary with infiltration and evaporation. Confined and semi-confined flow.
3. **Mechanics of Flow towards Well aquifers**, Classification. Specific yield, Storage co-efficient, Land subsidence due to ground water withdrawals, unconfined wells. Discharge of an ordinary perfect well as a function drawdown.
4. **Unconfined flow** towards well with uniform infiltration from the ground surface. Confined radial flow towards the well. Discharge as a function of drawdown, well efficiency, Radius of influence, Determination of permeability by one or two well methods.
5. **Lowering of ground water table**, Unsteady confined flow, Well losses.
6. **Geophysical Investigations** Surface geophysical techniques, Electrical resistivity, Seismic refraction and reflection, other methods.
7. **Ground Water Quality** : Water sampling, Potable water standards of WHO, Ground Water Basin Management and Conjunctive Use of Surface and Ground Water A case study, Investigation design, construction and maintenance of tube, wells, filter materials and education wells.

Text Books :

1. Ground water Hydrology by M. H. Raghunath, New Age Publication, New Delhi.
2. Irrigation Engineering and Hydraulic Structures by Sahasrabudhe. S. R., Katson, Ludhiana, 1975.

Reference Book :

1. 'Ground Water Hydrology' by Todd, David Keith (2007), Wiley India Edition, New Delhi – 110002.

01 1x56 ADVANCED SOIL MECHANICS

L- T- P : 3-0-0

Credit : 3

1. **Soil Structure & Mineralogy** : Soil texture, Solid particles in soil, Atomic & molecular bond. Interparticle forces in a soil mass. Single grained structure, Honey- comb structures. Flocculent & disperse, structures, Structure of connected soil.
2. **Clay minerals.**
3. **Soil Water** : Modes of occurrence of water in soils- Absorbed water, Double layer, Capillary water – Stress condition in soil- Effective & neutral pressures.
4. **Capillary permeability test**, Drainage & Dewatering Ditches & sumps, Well point system, Shallow well system. Deep well drainage, Electro-Osmosis method, Protective filters.
5. **Shear Strength** Use of Stress path in triaxial test- Undrained & drained tests for Normally Consolidated & Over Consolidated clay samples.
6. **Skempton's pore-pressure parameters**, Choice of shear parameters, Stability of open cut – braced open cut. Bishop's rigorous method, Limit equilibrium approach.
7. **Bulk Head & Cofferdams** : Classification – cantilever sheet pile wall in cohesionless and in cohesive soils Arching in soils, Classes of underground conduits, loads on positive projecting and negative projecting conduits.

Text Book :

1. Soil Mechanics, Lambe T. W. And Whitman, R. V. (1979), John Wiley & Sons Inc.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, Sai Kripa Publication, Bangalore.
3. Geotechnical Engineering, S. K. Gulathy et. al., TMH Publication New Delhi.

01 1x57 ADVANCED STRUCTURAL ANALYSIS

L- T- P : 3-0-0

Credit : 3

1. **Matrix method in skeletal structural analysis** : force and displacement methods including analysis substructures Non-linear and Elasto-plastic analysis.
2. **Analysis of plates**, Folded plates and singly curved shells, conventional and approximate methods.

01 1x58 INTRODUCTION TO EARTHQUAKE RESISTANT DESIGN METHODS

L-T-P - 3-0-0

Credit : 3

1. INTRODUCTION :-

Earthquakes, Epicentre, Earthquake waves, Seismic Regions, Intensity of Earthquakes, Magnitude and Energy of an Earthquake, Consequences of Earthquakes, Seismic Zoning, IS Recommendations.

Lecture : 06

2. DYNAMICS OF ELASTIC SYSTEMS:

Vibrations of single degree of Freedom System, Sources of vibrations, Types of vibrations, Degree of Freedom, Free and forced vibrations, vibrations of single Degree Freedom systems(Damped and undamped), Viscous Damping.

Lecture : 08

3. DYNAMICS OF SOILS AND SEISMIC RESPONSE :-

Dynamic behaviour of soil- stress condition of soil, settlement of dry sand, Liquefaction of saturated cohesionless soil, factors affecting liquefaction characteristics, Dynamic soil properties- Field tests and Laboratory tests, Prevention of liquefaction, Seismic Considerations for foundations- shallow and Deep foundation.

Lecture: 06

4. VIBRATION OF CONTINUOUS SYSTEM :-

Introduction to two Degree Freedom system, Multi Degree freedom system, Vibrations of continuous system, Axial and flexural free vibrations of Beime Forced vibrations-Earth quake excitations.

Lecture: 08

5. EARTHQUAKE RESISTANT:-

“Design of Structures Design Data and philosophy of design, Seismic co-efficient, Permissible stresses and load factors. Seismic analysis of multi storied Buildings. I.S. recommendations.

Lecture: 08

6. EARTHQUAKE RESISTANT:-

“Construction of Buildings “Recommendations of IS 4326, provisions of Horizontal band, provision of vertical re-enforcements, Special considerations for earthquake resistant foundation design for buildings.

Lecture: 06

