

## BE CIVIL ENGINEERING

### SEMESTER - 1

#### 19C101 CALCULUS AND ITS APPLICATIONS

3 1 0 4

**DIFFERENTIAL CALCULUS** : Function of two variables, limits and continuity, partial derivatives, chain rule, extreme values and saddle points, Lagrange multipliers, Taylor's formula for two variables. (9 + 3)

**INTEGRAL CALCULUS** : Double integrals — double and iterated integrals over rectangles, double integrals over general regions, Fubini's theorem, area and volume by double integration, reversing the order of integration, polar form. (9 + 3)

**FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS** : Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, modeling - mixing problems, Newton's law of cooling. (9 + 3)

**SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS** : Homogeneous linear equations of second order, homogeneous linear ODEs with constant coefficients, Euler–Cauchy equations, solution by variation of parameters, free oscillations of mass-spring systems. (9 + 3)

**VECTOR CALCULUS** : Gradient and directional derivative of a scalar field, divergence and curl of a vector field. Integration in vector field — line integrals, path independence of line integrals, Green's theorem in the plane, divergence theorem of Gauss and Stokes's theorems. (9 + 3)

**Total L: 45 +T: 15 = 60**

#### TEXT BOOKS:

1. Joel Hass, Christopher Heil, Maurice D.Weir "Thomas' Calculus", Pearson Education., New Delhi, 2018
2. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015

#### REFERENCES:

1. Howard Anton, Irl Bivens, Stephen Davis "Calculus", John Wiley & Sons, INC., USA, 2016
2. Wylie C R and Barrett L C "Advanced Engineering Mathematics", Tata McGraw-Hill., New Delhi, 2019
3. Michael D.Greenberg "Foundations of Applied Mathematics", Dover Publications, INC., New York, 2013
4. Gilbert Strang "Calculus", Wellesley Cambridge Press., USA, 2017

#### 19C102 PHYSICS

3 0 0 3

**PROPAGATION OF ELASTIC WAVES** : Structural vibrations and Simple harmonic motion. Velocity damping. Damping coefficient. Differential equation of SHM. Velocity and acceleration. Restoring force. Vibration of a spring and mass system. Frequency response, phase response and resonance. Definition of a plane progressive wave. Attenuation of waves. Differential equation of a plane progressive wave. Phase velocity. Phase and phase difference. Solution of the differential equation of a plane progressive wave. Reduction of acoustic conduction. (10)

**TESTING OF MATERIALS BY ELASTIC WAVE PROPAGATION** : Impact echo method-determination of thickness of concrete and flaw detection. S, P and R waves and their dependence on elastic moduli. Ultrasonic flaw detection- Frequency and power. Pulse echo method of flaw detection. Single and phase-array transducers- waveform synthesis and scanning-A,B,C and S Scan. Principle of Laser Ultrasonometry. (8)

**LASERS** : Properties of laser radiation and their significance-wavelength, power, monochromaticity, coherence. Types of lasers-working media and their radiation characteristics-Power, wavelength and operational modes of He-Ne, Nd-YAG, Carbon-dioxide, excimer, diode lasers. Physical principles of Laser beam delivery systems. Applications-Ranging and survey, cutting and welding. Selection of lasers for various applications. (8)

**MECHANICAL PROPERTIES** : Stress and strain, Hooke's law, classification of elastic modulus, poisson's ratio, elastic limit, yield point, factors affecting elastic modulus and tensile strength, bending of beam, expression for bending moment-cantilever, I shape girders, Viscosity, coefficient of viscosity, streamline and turbulent flow, Reynolds number, stokes law (9)

**THERMAL PROPERTIES** : Specific heat capacity, thermal capacity. Coefficient of linear thermal expansion. Methods of measurement of thermal expansion. Thermal stresses in composite structures due to non-homogeneous thermal expansion. Applications -The bimetallic strip. Expansion gaps and rollers in engineering structures. (10)

**Total L: 45**

#### TEXT BOOKS:

1. M.N. Avadhanulu and P.G. Kshirsagar "A text book of Engineering Physics", S. Chand and Company., New Delhi, 2013, 10th
2. M.D.Kannan, V.Balusamy "Engineering Physics", Vikas Publications., 2009

#### REFERENCES:

1. Crawford. F.S.Jr. "Waves — Berkeley Physics Course", Tata McCraw-Hill., 2008
2. Purcell E M "Electricity and Magnetism — Berkeley Physics Course", Tata McCraw-Hill., 2008
3. James F.Shackelford "Introduction to Material Science for Engineers", Prentice Hall., 2014 , 8th
4. John W. Jewett, Raymond A. Serway "Physics for Scientists and Engineers", Cengage Learning., 2017 ,9th

### 19C103 APPLIED CHEMISTRY

3 0 0 3

**WATER AND SOLUTION CHEMISTRY :** Hardness, alkalinity, pH, TDS, DO, COD and BOD-estimation methods. Deionization and desalination of water. Phase rule — application to water system, ethanol-water system. Distribution law-principle of extraction. Solubility of gases in liquids. Surface active agents — types — association in solution spreading and contact angle — wetting and water repellency — super hydrophobic coating - applications. (9)

**POLYMERS :** Classification, functionality of monomers, degree of polymerization, weight and number average molecular weights (Definition only). Polymerization reactions — chain mechanism. structure related to thermal, mechanical and electrical properties. Compounding of plastics, polymer processing by injection, extrusion, compression and blow moulding techniques. Polymers in civil engineering- structural plastics and composites, polymer membranes, coating, polymer concretes. Thermal insulating foams, composite —geocomposites, geotextiles. (9)

**CEMENT AND LIME :** Cement —chemical composition, raw materials for manufacturing of Portland cement — dry and wet processes — reactions in rotary kiln. Types of Portland cement — rapid hardening cement, low heat cement, sulphate resisting cement, white and coloured portland cement, Pozzolona cement, blended cement, water proof cement. (9)

**CORROSION AND ITS PREVENTION :** Oxidation — mechanism - Pilling —Bedworth rule. Galvanic corrosion, differential aeration corrosion, atmospheric corrosion, pitting corrosion, waterline corrosion and soil corrosion. Factors influencing corrosion, corrosion of rebar's in concrete. Corrosion control —cathodic protection, selection of materials and proper designing. (9)

**PAINTS, ADHESIVES AND GLASSES :** Paints — constituents and their functions, mechanism of drying modern film forming polymers — types. Special paints -fire retardant, water repellent, temperature indicating and luminous paints. Varnishes, enamels and lacquers. Adhesives — Physical and chemical factors influencing adhesive strength. Glasses — types and composition, laminated glass, glass wool. Selection of glass. (9)

Total L: 45

#### TEXT BOOKS:

1. Jain P C and Jain M "Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi., New Delhi, 2005 , 1st Ed
2. Shashi Chawla "A Text Book of Engineering Chemistry", Dhanpat Rai & Co., New Delhi, 2005 , 1st ed

#### REFERENCES:

1. Jackson N, Dhir R K "Civil Engineering Materials", Brijibasi Art press Ltd., Noida, 2007 , 1
2. Shan S "Civil Engineering Materials", Pearson Education. Inc — Prentice Hall., New Delhi, 2012 , 1
3. Sharma B. K. "Engineering Chemistry", KrishnaPrakashan Mandir Pvt. Ltd., Meerut, 1999 , 1

### 19C104 ENGINEERING GEOLOGY

3 0 0 3

**GENERAL GEOLOGY :** Geology in Civil Engineering — Branches of geology — Earth Structures and composition — Elementary knowledge on continental drift and plate tectonics—Geological Time scale—Earth processes — Weathering - Types of soils — Work of rivers and wind and their engineering importance. Engineering Seismology- causes of earthquakes; seismic waves; magnitude, intensity and energy release, seismic zones of India- Earthquake belts in world (9)

**MINERALOGY :** Elementary knowledge on symmetry elements of important crystallographic systems — physical properties of minerals — study of the following rock forming minerals — Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Gypsum, Garnet —Identification of minerals- properties, behaviour and engineering significance of clay minerals — Fundamentals of process of formation of ore minerals — Coal and petroleum—Their origin and occurrence in India (9)

**PETROLOGY :** Classification of rocks — distinction between igneous, sedimentary and metamorphic rocks. Description, occurrence, engineering properties and distribution of following rocks. Igneous rocks — Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks sandstone, Limestone, shale, Conglomerate and breccia. Metamorphic rocks. Quartzite, Marble, Slate, Charnockite, Phyllite, Gneiss and Schist Identification of rocks and commercial granites and marbles-Testing on rock as a construction material. (9)

**STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD :** beds — Outcrops- Introduction to Geological maps — study of structures — Folds, faults and joints — Their bearing on engineering construction. Seismic and Electrical methods for Civil Engineering investigations- Clinometer- Brunton Compass-Geology of India -Types and occurrence of rock formation (9)

**GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING** : Remote sensing techniques- Applications in Civil Engineering- Groundwater -occurrence — Investigation , quality, recharge — importance in civil engineering. Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Landslides Causes and prevention. Sea erosion and coastal protection (9)

**Total L: 45**

**TEXT BOOKS:**

1. Parbin Singh "Engineering and General Geology", K Kataria & Sons., New Delhi, 2013 , Reprint 2013
2. Tony Waltham "Foundations of Engineering Geology", Spon Press., Londaon, 2002 , Second

**REFERENCES:**

1. Legget R. F. and Hatehway A. W "Geology and Engineering", McGraw Hill Book Company., New York, 1988 , Third
2. Gokhale KVGK "Principles of Engineering Geology", BS Publications., Hyderabad, 2013
3. Bell F. G "Engineering Geology", Butterworth-Heinmann., Oxford, 2007 , Second

**19G105 ENGLISH LANGUAGE PROFICIENCY**

**2 1 0 3**

**LEARNING LANGUAGE THROUGH STANDARD LITERARY AND GENERAL TEXTS** : Integrated tasks focusing on language skills ; Training based on Text based vocabulary, tone, register and Syntax features (12 + 0)

**GRAMMAR IN CONTEXT** : Word Order ; Subject Verb Concord ; Style features - Tenses, Conditionals, Prepositions, Active and Passive Voice, Modals, Cloze and Spotting Error exercises (10 + 0)

**GUIDELINES FOR WRITTEN COMMUNICATION** : Principles of clear writing, Paragraph writing, Essay writing, Emphasis Techniques, Summarizing and Paraphrasing, Analytical writing (8 + 0)

**FOCUS ON SPOKEN ENGLISH** : Task — based activities: Graded levels of difficulty and with focus on language functions - Level 1: Self — expression — Greetings in Conversation, Hobbies, Special interests, Daily routine - Level 2: General Awareness — Expression of Concepts, Opinions, Social Issues, Description of a process / picture/chart, news presentation / review - Level 3: Advanced Skills — Making Short Speeches and Participating in Role Plays (0 + 10)

**LISTENING ACTIVITY** : Task based activities using Language Laboratory (0 + 5)

**Total L: 30 +T: 15 = 45**

**TEXT BOOKS:**

1. Faculty Incharge "Course Material on "English Language Proficiency", PSG College of Technology., Coimbatore, 2019

**REFERENCES:**

1. Jill Singleton "Writers at Work: The Paragraph", Cambridge University Press., New York, 2012
2. Simon Haines, Mark Nettle and Martin Hewings "Advanced Grammar In Use", Cambridge University Press., New Delhi, 2008
3. Anne Laws "Writing Skills", Orient Black Swan., Hyderabad, 2011
4. Sinha DK "Specimens of English Prose", Orient Black Swan., Hyderabad, 2012

**19C110 BASIC SCIENCES LABORATORY I**

**0 0 4 2**

**PHYSICS LABORATORY ( ANY EIGHT ) :**

1. Determination of Young's modulus — Uniform bending
2. Determination of rigidity modulus of a given material using Torsion pendulum
3. Determination of coefficient of viscosity of water — Poiseuille's method
4. Determination of viscosity — Searle's method
5. Determination of Specific Heat Capacity of solids — Calorimeter
6. Determination of fibre thickness — Air wedge method
7. Determination of wavelength of He-Ne laser using reflection grating.
8. Measurement of vibration frequency of electrically maintained tuning fork using Melde's apparatus
9. Determination of refractive index of glass using laser
10. Determination of Young's Modulus of a wooden bar — Cantilever method (30)

**CHEMISTRY :**

1. Estimation of hardness by ion-exchange resin method.
2. Estimation of Ca<sup>2+</sup> and Mg<sup>2+</sup> hardness of water by EDTA method
3. Determination of DO and COD of water sample conductance.
4. Determination of pH, conductivity, TDS and alkalinity of water sample.
5. Determination of corrosion rate.
6. Determination of solubility of sparingly soluble salt.
7. Estimation of calcium in cement.
8. Determination of molecular weight of polymers by Ostwald / Ubbelohde Viscometer. (30)

Total P: 60

**REFERENCES:**

1. Department of Physics "Physics Practicals", PSG College of Technology., Coimbatore, 2015
2. Wilson J. D. and Hernandez C. A "Physics Laboratory Experiments", Houghton Mifflin Company., New York, 2005

**19C111 C PROGRAMMING LABORATORY**

**0 0 4 2**

1. Working with RAPTOR Tool — Flowchart Interpreter
2. Simple programs to understand Operators and expressions.
3. Decision making Statements : simple if, if..else, nested if .. else, elseifladder, switch case
4. Loops : while , do..while, for
5. Implementation of one dimensional array
6. Implementation of two dimensional array
7. Working with Strings
8. Functions
9. Recursive functions
10. Structures: Arrays and Structures, Nested Structures
11. Structures and functions
12. Implementation of pointer and pointer arithmetic
13. Types of pointer: const pointer, pointer to a constant, void pointer, null pointer

Total P: 60

**1. REFERENCES:**

2. Deitel H. M. and Deitel P. J "C: How To Program", Prentice Hall of India., New Delhi, 2015
3. Ajay Mittal "Programming in C - A Practical approach", Pearson., New Delhi, 2010
4. Gottfried B "Programming with C", McGraw Hill Education., New Delhi, 2018
5. Herbert Schildt "C: The Complete Reference", McGraw Hill., New Delhi, 2017

**19IP15 INDUCTION PROGRAMME**

**0 0 0 0**

As per AICTE guidelines

**SEMESTER - 2**

**19C201 COMPLEX VARIABLES AND TRANSFORMS**

**3 1 0 4**

**COMPLEX DIFFERENTIATION** : Derivative, analytic function, Cauchy-Riemann equations, Laplace's equation, linear fractional transformations. (9 + 3)

**COMPLEX INTEGRATION** : Cauchy's integral theorem, Cauchy's integral formula, Laurent series, singularities and zeros, residue integration method (Residue integration of complex integrals only). (9 + 3)

**LAPLACE TRANSFORMS** : Laplace transform, linearity, first shifting theorem, transforms of derivatives and integrals, ODEs, unit step function, second shifting theorem, Dirac's delta function, periodic functions. (9 + 3)

**FOURIER SERIES AND FOURIER TRANSFORMS** : Fourier series — arbitrary period, even and odd functions, half range expansions. Fourier transforms, Fourier cosine and sine transforms. (9 + 3)

**PARTIAL DIFFERENTIAL EQUATIONS** : Basic concepts of PDEs, wave equation, heat equation, steady state two-dimensional heat problems, solution by separating variables and Fourier series. (9 + 3)

Total L: 45 +T: 15 = 60

**TEXT BOOKS:**

1. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015
2. Wylie C R and Barret L C "Advanced Engineering Mathematics", Tata McGraw-Hill., New Delhi, 2019

**REFERENCES:**

1. Dennis G Zill and Patrick D Shanahan "A First Course in Complex Analysis with Applications", Jones and Bartlett Pvt Ltd., New Delhi, 2015
2. Mathews J H and Howell R W "Analysis for Mathematics and Engineering", Narosa Publishing House., New Delhi, 2012
3. Peter V.O Neil "Advanced Engineering Mathematics", Cengage., New Delhi, 2016
4. Dennis G Zill "Advanced Engineering Mathematics", Jones & Bartlett Pvt Ltd., New Delhi, 2017

## 19C202 ENGINEERING MECHANICS

3 1 0 4

**STATICS OF PARTICLES & BODIES** : Forces - Systems of forces - Concurrent forces in plane and space-Resultant equilibrium of a particle-free body diagram- rigid bodies under plane forces - moment of a force - moment of a couple - equivalent systems of coplanar forces - equilibrium of rigid bodies - types of supports - types of beams - support reactions - analysis of trusses by method of joints and method of sections (11 + 4)

**FRICTION** : Friction - frictional force - limiting friction - laws of static friction - coefficient of friction - angle of repose - single bodies on horizontal and inclined planes - connected bodies on horizontal and inclined planes - ladder friction - wedge friction (8 + 2)

**CENTROID, AND MOMENT OF INERTIA** : Centroids of areas - centroids of simple geometric shapes - centroids of composite areas - moment of inertia - perpendicular axis theorem - parallel axis theorem - moment of inertia of simple geometric sections - moment of inertia of composite sections - polar axis - polar moment of inertia – radius of gyration - mass moment of inertia of simple solids. - (8 + 3)

**KINEMATICS OF PARTICLES** : Types of motion - Motion curves - Rectilinear motion - time dependent motion - uniformly accelerated motion - projectile motion (8 + 3)

**KINETICS OF PARTICLES** : Rectilinear motion - Newton's II law - D'Alembert's principle - Energy - potential energy - kinetic energy - conservation of energy - Work done by a force - work energy method - conservation of momentum - impulse momentum principle - Impact-Direct central impact-oblique central impact. (10 + 3)

**Total L: 45 +T: 15 = 60**

### TEXT BOOKS:

1. Beer F P, Johnson E R "Vector Mechanics for Engineers - Statics & Dynamics", tata MCGraw Hill Publishing Co Ltd., New Delhi, 2016
2. Rajasekaran S, Sankarasubramanian G "Engineering Mechanics - Statics & Dynamics", Vikas Publishing House Pvt Ltd., New Delhi, 2006

### REFERENCES:

1. Bansal R K "Engineering Mechanics", Laxmi Publications., New Delhi, 2008
2. Bhavikatti S S "A Text book of Engineering Mechanics", New Age International Pvt Ltd., New Delhi, 2008

## 19C203 APPLIED PHYSICS

2 0 0 2

**ARCHITECTURAL ACOUSTICS** : Concepts of sound waves-propagation of sound waves-intensity. Reverberation: Reverberation time-Salient features for an acoustically good room. Absorption- Coefficient of absorption- Absorption materials. Sabine's Formula. Structure of the building for an acoustically good auditorium school, concert hall, early reflections, standing wave resonances (small spaces). Noise - Indoor and extraneous. Noise control methods — Principle of active noise cancellation (8)

**LIGHTING AND PHOTOMETRY** : Concepts of illumination - Irradiance-brightness - Photometer - Intensity of illumination. Inverse square law and cosine law of illumination. Day lighting. Artificial lighting. Lighting in building. Design strategies using day light. Colour perception (7)

**HEAT FLOW** : Modes of propagation of heat-conduction of heat through compound medium, radial and cylindrical flow. Thermal Conductivity-Lee's method for bad conductors- Forbes method for good conductors. Thermal comfort factors- Design for minimal heat loss by conduction, radiation. Forced convection-Air filters- Green house effect. (8)

**ENERGY EFFICIENT BUILDINGS** : Electrical energy-Principle of solar cells. Manufacture of solar panels. Economic considerations in using solar power. Principle of solar collectors. Factors affecting efficiency. Building envelope - economy of air conditioning and refrigeration. Principle of Passive solar buildings (7)

**Total L: 30**

### TEXT BOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar "A text book of Engineering Physics", S. Chand and Company., New delhi, 2009
2. R.K. Gaur, S.L. Gupta "Engineering Physics", Dhanpat Rai Publications (P) Ltd., New delhi, 2001 , Eight edition

### REFERENCES:

1. Krishnan Kumar Chawla "Composite materials: Science and Engineering", Springer., 1998
2. Richard Wolfson "Essential University Physics", Pearson Education., Singapore, 2011
3. Davis, R. O. Selvadurai "Elasticity and Geomechanics", Cambridge University Press., USA, 1996
4. Paul M. Fishbane, Stephen, Gasiorowicz, Stephen T. Thornton "Physics For Scientists And Engineers", Addison Wesley., 2001

## 19C204 CHEMISTRY OF ENGINEERING MATERIALS

2 0 0 2

**METALLIC MATERIALS IN CONSTRUCTION** : Fundamental terminologies — Ferrous metal — cast iron — wrought iron — steel — mild steel — High tensile steel. Mechanical properties of steel — Behaviour of steel under tension — Al, Cu, Zn — process manufacturing, Properties and uses. Non — Ferrous Alloys — Brass — Bronze — German Silver. (6)

**TIMBER AND WOOD BASED PRODUCTS** : Sources — Moisture in timber — Hygroscopic nature — Permissible moisture content — determination — mention of mechanical properties — Cleavability. Defects in timber. Wood Products — Glulam — Plywood — panel products — manufactured components. Chemical treatments — water resistance — insect resistance. (6)

**INSULATING AND COMPOSITE MATERIALS** : Types of insulating materials — air spaces, aerated concrete, gypsum, expanded blast furnace slag- sprayed asbestos, vermiculate, coconut fibres, cork board, cellulose, fibre glass. Classification and constituents of composites — fiber — reinforced composites and its failure — particle reinforced composites — particulate composites — structural composites — advanced composite (6)

**BITUMINOUS MATERIALS AND MIXTURES** : Introduction — tar and pitches. asphalts — petroleum asphalts — asphalt cement — cutback asphalts — emulsified asphalts — air blown asphalts. Properties of asphalts — adhesion — specific gravity — durability, rate of curing — ageing and hardening — resistance of reaction with water. (6)

**SOIL** : Types — Classification and character. Basic properties — specific properties — water content - derived soil properties and inter relationships, pE — pH Diagrams - redox chemistry of soils. (6)

**Total L: 30**

### TEXT BOOKS:

1. Neil J. and Dhir R K "Civil Engineering Materials", Brijbasi Art Press Ltd., Noida, 2007
2. Sparks D. L "Environmental Soil Chemistry", Academic Press., UK, 2003

### REFERENCES:

1. Duggal S. K. "Building Materials", New Age International (P) Ltd., India, 2003 , 4
2. Kulkarni P. D., Subramanian R., Gallon P. S., Juneja A., Puri V. P., Likhi S. K "Civil Engineering Materials", Tata McGraw Hill., New Delhi, 1997 , 1
3. Stanley E Manahan "Fundamentals of Environmental Chemistry", CRC Press., LLC, 2001 , seventh edition

## 19C210 ENGINEERING GRAPHICS

0 0 4 2

### ORTHOGRAPHIC AND PICTORIAL PROJECTION:

1. Introduction to Engineering Drawing. BIS. Principles of dimensioning.
2. Principles of orthographic projection-projection of points, straight lines, planes and solids.
3. Principles of pictorial views, isometric view of simple engineering components
4. Orthographic views from given pictorial views
5. Isometric views from given two or three views (30)

### SECTION OF SOLIDS: AND DEVELOPMENT OF SURFACES :

1. Section of regular solids, types of sections, selection of section views
2. Sectional views of simple engineering components
3. Development of lateral surfaces of regular solids and truncated solids. (30)

**Total P: 60**

### TEXT BOOKS:

1. Natarajan K. V "Engineering Drawing and Graphics", M/s Dhanalakshmi N., Chennai,, 2007.
2. Luzadder and Duff "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd.,, 2009.

### REFERENCES:

1. Bureau of Indian Standards "Engineering Drawing Practices for Schools and Colleges SP 46-2003", BIS., New Delhi,, 2004
2. Venugopal K. and Prabhu Raja V "Engineering Graphics", New Age International Publishers.,, 2007.

## 19C211 ENGINEERING PRACTICES

0 0 2 1

1. Foundry- Tools, preparation of moulding sand, patterns, cores, foundry exercises.
2. Welding - Metal arc welding tools and equipment, exercises on arc welding and MIG welding processes.
3. Fitting - Tools, operations, exercises on "T"-Joint and "L" Joint, types of joints.
4. Carpentry- Tools, carpentry process, exercises on types of joints.
5. Plumbing-Exercises on external thread cutting and joining.

6. Sheet metal work and soldering - Tools, operations, exercise on rectangular tray using Galvanized Iron sheet.

**Total P: 30**

**REFERENCES:**

1. Department of Mechanical Engineering "Engineering Practices Laboratory Manual", PSG College of Technology., Coimbatore, 2019
2. Chapman W.A.J "Workshop Technology", Edward Arnold., 2001

**19C212 BASIC SCIENCES LABORATORY II**

**0 0 4 2**

**PHYSICS LABORATORY (ANY EIGHT):**

1. Photometry — Law of distance
2. Determination of thermal conductivity of good conductor — Forbe's method
3. Determination of velocity of sound — Helmholtz resonator
4. Determination the frequency of the tuning fork — Sonometer
5. Determination of thermal conductivity of bad conductor using Lee's Disc method
6. Determination of thermal conductivity of a metallic material using Wiedemann — Franzlaw
7. Study of I-V characteristics of solar cell and determination of its efficiency
8. Particle size determination using Laser
9. Measurement of temperature using LM35
10. Study of characteristics of Photo Diode

(30)

**CHEMISTRY:**

1. Electroplating of nickel / copper and determination of cathode efficiency.
2. Determination of kinematic viscosity of lubricating oil using Redwood viscometer.
3. Estimation of ferrous iron by potentiometry.
4. Proximate analysis of coal.
5. Determination of contact angle -water repellency study.
6. Anodizing of aluminium and determination of thickness of anodised film.
7. Soil analysis I — pH, EC and sulphate estimation
8. Soil analysis II — Ion exchange capacity, silica content.

(30)

**Total P: 60**

**REFERENCES:**

1. Department of Physics "Physics Practicals", PSG College of Technology., Coimbatore, 2015
2. Wilson J. D., Hernandez C. A "Physics Laboratory Experiments", Houghton Mifflin Company., New York, 2005

**19C213 INTERNSHIP**

**0 0 0 2**

**HISTORICAL PERSPECTIVE OF CIVIL ENGINEERING:**

Introduction: History of civil engineering - Structures from Indian and world perspective, construction techniques and materials Disciplines in civil engineering: structural engineering, Geotechnical engineering Water Resources Engineering, Surveying, public health engineering, material science

Choice of careers in civil engineering: Structural engineering, Geotechnical engineering, Coastal engineering, Material engineering, Transportation engineering, Water resource engineering, project planner, valuer, design engineer, builder, consultant. Dimensional Homogeneity - units and dimensions — basic and derived units.

**INDUSTRIAL VISIT, WRITING TECHNICAL REPORT AND SEMINAR PRESENTATION**

Importance of organization structure, role and responsibilities, Construction safety and Environment standards, Construction material specifications — Visit to cement manufacturing industry and other civil engineering construction sites

Writing coherent project report: Overview structure of reports, gathering information - synopsis / abstract - title headings — table of contents — list of figures — list of tables — list of appendices — chapters — structured paragraphs inferences, conclusions — figures — tables — flow charts — complete design (headers and footers) -Plagiarism.

Each student will be required to submit a technical report and make one technical presentation based on the guidelines provided by the department.

## SEMESTER - 3

### 19C301 NUMERICAL METHODS

2 1 0 3

**SYSTEM OF LINEAR EQUATIONS, EIGENVALUES AND EIGENVECTORS** : Errors - approximations and round-off errors - truncation errors - system of linear equations-Gauss-elimination method, Crout's method, Gauss-Seidel method, eigenvalues and eigenvectors - power method. (6 + 3)

**NONLINEAR EQUATIONS** : False-position method, Newton-Raphson method, modified Newton-Raphson method, Bairstow's method. (6 + 3)

**INTERPOLATION, DIFFERENTIATION AND INTEGRATION** : Lagrange interpolating polynomials, equally spaced data-Newton's forward and backward interpolating polynomials, numerical differentiation — evenly spaced data, numerical integration- Newton-Cotes formulae, Trapezoidal rule, Simpson's 1/3 rule. (6 + 3)

**NUMERICAL SOLUTION TO ORDINARY DIFFERENTIAL EQUATIONS** : Taylor-series method, Euler method, 4th order Runge-Kutta method, multi step method - Milne method. (6 + 3)

**NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS** : Finite difference: elliptic equations- Laplace equation, Poisson equation – Liebmann method, parabolic equations – heat conduction equation – Crank Nicolson's method, hyperbolic equations – vibrating string. (6 + 3)

**Total L: 30 +T: 15 = 45**

#### TEXT BOOKS:

1. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", Tata McGraw Hill, New Delhi, 2017.
2. Curtis F Gerald and Patrick O Wheatly , "Applied Numerical Analysis", Pearson, New Delhi, 2017.

#### REFERENCES:

1. Richard L Burden and Douglas J Faires, "Numerical Analysis", Thomas Learning, NewYork, 2017.
2. G. Miller , "Numerical Analysis for Engineers and Scientists", Cambridge University Press, UK, 2014.
3. Amos Gilat and Vish Subramaniam, "Numerical Methods for Engineers and Scientists ",Wiley India, New Delhi, 2014.
4. Ward Cheney and David Kincaid, "Numerical Mathematics and Computing", Cengage learning, USA, 2018.

### 19C302 MECHANICS OF SOLIDS I

3 1 0 4

**STRESSES AND STRAINS** : Stress and strain due to axial force - Elastic limit - Hooke's law - Factor of safety - Stepped bars - uniformly varying sections - composite bar - stresses due to temperature. (8 + 3)

**DIMENSIONAL CHANGES AND STRAIN ENERGY** : Lateral strain - Poisson's ratio - Volumetric strain - changes in dimensions and volume - shear stress - shear strain - Relationship between elastic constants - Hoop and Longitudinal stresses in thin cylindrical and spherical shells under internal pressure - changes in dimensions and volume. - Strain Energy due to axial force - proof resilience and modulus of resilience - stresses due to gradual load, sudden load and impact load. (9 + 3)

**BENDING OF BEAMS** : Shear force and bending moment at a section - Relationship between load intensity, shear force and bending moment - Shear force and bending moment diagrams for cantilever, simply supported and over hanging beams under point loads, uniformly distributed load, uniformly varying loads and concentrated moment - maximum bending moment and point of contraflexure. - Theory of simple bending and assumptions -flexural formula - section modulus - normal stress due to bending - shear stress distribution. (12 + 4)

**TORSION** : Theory of torsion and assumptions - Derivation of torsion formula - Polar modulus - stresses in solid and hollow circular shafts - Power transmitted by a shaft - Strain Energy due to torsion - close coiled helical spring under axial load. (8 + 2)

**PRINCIPAL STRESSES AND STRAINS (TWO DIMENSIONAL ONLY)** : State of stress at a point - Normal and tangential stresses and their planes - Principal Stress and their planes - Plane of maximum shear stress - Analytical method - Mohr's circle method - Principal strains - Analytical and graphical methods. (8 + 3)

**Total L: 45 +T: 15 = 60**

#### TEXT BOOKS

1. Popov E.P, Balan TV , "Mechanics of Materials", Prentice Hall, New Jersey, 2015.
2. Bansal R K , "Strength of Materials", Laxmi Publications, New Delhi, 2010.

#### REFERENCES:

1. Punmia B C, Ashok Jain, Arun Jain , "Strength of Materials and Theory of Structures", Laxmi Publications, New Delhi,



2001.

- Hearn E J , "Mechanics of Materials", Butterworth-Heinemann, Oxford,2001.

## 19C303 CIVIL ENGINEERING MATERIALS AND CONSTRUCTION

3 0 0 3

**BUILDING REGULATIONS AND FOUNDATION :** Functional planning of buildings- Site selection- site plan-Planning regulations and by-laws– principles of planning — orientation of buildings- National Building Code — types of buildings — building components and their requirements– fire safety rules — fire safety construction — fire resisting properties of materials- Foundations — need — bearing capacity — settlement — types of foundation — setting out of foundation. Basement: Need—types—construction practice—basement filling. (9)

**MASONRY CONSTRUCTION:** Manufacture of brick — classification - qualities — test on bricks — brick masonry construction practice — bonds and rules –mortar types — strength of brick masonry. Stone masonry materials — stones—stone masonry construction—types—uses. Hollow concrete masonry- types—construction practice -Flyash bricks - construction practice - Reinforced brick masonry construction practice- composite masonry. (9)

**FLOORS AND ROOFS :** Selection of floorings-construction of ground floors- choice of construction of upper floors- constructions of upper floors-factors affecting choice of flooring material-materials used for flooring- sloping roofs- roof trusses-pitched roofs- Ventilators in pitched roof-methods to secure pitched roofs against uplift-drainage of pitched and flat roofs-roof coverings and their selection-flat roofs-shell roofs- domes. (9)

**VERTICAL TRANSPORTATION AND TEMPORARY STRUCTURES :** Staircases — types — staircase planning and geometric rules — materials — construction practice. Lift: Types — basic components — lift well construction — safety rules. Escalators and walk ways — basic concept and construction practice. Lift with and without head room-dumbwaiter- vertical conveyors-Glass-Constituents-manufacture-commercial forms of glasses- Formwork-scaffolding- shoring-underpinning. (9)

**BUILDING FINISHES AND SERVICES:** Plastering — types — cement mortar plastering — construction practice. Painting — materials and practice for walls — wood and steel. Joineries: Doors and windows — types — fixtures and fastener- water supply — sewage disposal — plumbing — electrical wiring — basic needs of building services for housing—materials—construction practice—safety and maintenance rules. (9)

**Total L: 45**

### TEXT BOOKS:

- Arora S. P. and Bindra S. P., "A Text Book of Building Construction: Including Engineering Materials for Engineering Students", 10<sup>th</sup> Edition, Dhanpat Rai and Sons, NewDelhi, 2010.
- G C Sahu, Joygopal Jena, "Building Materials and Construction", 2<sup>nd</sup> Edition, Mc Graw Hill Education, NewDelhi, 2015.

### REFERENCES:

- Rangwala S.C and Rangwala K.S, "Building Construction", 10<sup>th</sup> Edition, Charotar Publishing House Pvt Ltd, Gujarat, 2010.
- Varghese P.C , "Building Construction", 10<sup>th</sup> Edition, PHI Learning Private limited, New Delhi, 2010.
- Rajput R. K , "Engineering Materials", 11<sup>th</sup> Edition, S.Chand & Co.(P) Ltd, New Delhi, 2012.
- Punmia B.C., Ashok kumar jain, Arun kumar Jain , "Building Construction", 10<sup>th</sup> Edition, Laxmi Publications Private Limited, New Delhi, 2012.

## 19C304 MECHANICS OF FLUIDS

3 0 0 3

**FLUID PROPERTIES, FLUID PRESSURE AND ITS MEASUREMENT:** Dimensions and units - Fluid properties - Types of fluids - Hydrostatic law; Pascal's law - Atmospheric, Absolute, Gauge and Vacuum pressures - Measurement of pressure by various types of manometers and mechanical gauges. (9)

**FLUID STATICS, BUOYANCY AND FLOATATION :** Total pressure on plane and curved surfaces - Centre of pressure for vertical and inclined plane surfaces - Buoyancy and Meta-centre - Determination of Meta-centric height — Analytical and experimental methods - Conditions of equilibrium of submerged and floating bodies. (9)

**FLUID KINEMATICS AND DYNAMICS** : Classification of fluid flow - Stream line - Streak line and Path lines - Continuity equation - Velocity potential function and Stream function - Flow net properties and its uses - Energy possessed by a fluid body in motion - Euler's equation of motion - Bernoulli's equation and its applications - Discharge measurement, Venturimeter, Orifice meter. (11)

**BOUNDARY LAYER** : Introduction- boundary layer thickness and classification- displacement and momentum-separation of boundary layer - methods of controlling boundary layer separation. (8)

**DIMENSIONAL ANALYSIS, SIMILITUDE AND MODEL ANALYSIS** : Methods of Dimensional Analysis - Rayleigh's method - Buckingham's theorem - Hydraulic Similitude - model analysis - dimensionless numbers - Model testing of partially submerged bodies - types of models. (8)

**Total L: 45**

**TEXT BOOKS:**

1. Modi P N and Seth S M , "Hydraulics & Fluid Mechanics Including Hydraulics Machines", 22<sup>nd</sup> Edition, Standard Book House, Delhi, 2017.
2. R.K. Bansal , "A Textbook of Fluid Mechanics and Hydraulic Machines", 10<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2018.

**REFERENCES:**

1. Yunus A. Cengel, John. M. Cimbala , "Fluid Mechanics; Fundamentals and Applications", Fourth edition, McGraw-Hill, 2019.
2. Kumar K L , "Engineering Fluid Mechanics", S Chand & Company Ltd, New Delhi, 2013.
3. Rajput P K , "Textbook of Fluid Mechanics and Hydraulic Machines", S Chand & Company Ltd, New Delhi, 2014.

## 19C305 SURVEYING

**3 0 0 3**

**INTRODUCTION TO CHAIN AND COMPASS SURVEYING** : Definition - Principles - Classification - Field work and office work - Types of chain - methods of ranging a line - Chain survey of an area - uses of cross - staff and optical square - sources and limits of error and their correction - Magnetic and true north - magnetic declination and its variation - Bearings - Prismatic compass - Surveyor's compass-Compass survey-local attraction and its elimination-Traversing. (9)

**LEVELLING** : Principles and theory of levelling - Datum - bench mark and reduced level - level surface and horizontal plane - mean sea level - Types of levels - levelling staff and their types - effect of curvature and refraction- Balancing back sight and foresight distance - Longitudinal and cross-sectional levelling - Reducing levels by rise and fall and height of collimation methods and check. (9)

**THEODOLITE SURVEYING** : Theodolite - types, features and fundamental axes - adjustments; temporary and permanent - methods of measurement of horizontal angles - taking vertical angles - Heights and distances of inaccessible points - methods of traversing - problems on omitted measurements. (8)

**TACHEOMETRIC SURVEYING AND ADVANCED SURVEYING INSTRUMENTS** : Methods - Determination of constants of the tacheometer - use of anallactic lens - distance and elevation formulae for inclined sights with vertical and normal holding staff - movable hair method - principles of tangential tacheometry-problems in tacheometry –subtense bar method. - Advanced Total Station - Electronic Theodolite - Laser alignment instrument – Global Positioning System. (10)

**CONTOURING AND CURVES** : Definition - Contour interval and horizontal equivalent - characteristics - interpolation-contouring by grid and radial methods - Drawing contour lines - uses of contour maps - drawing of contours using computers. - Definitions - Designation of a curve - Elements of simple curve - Location of tangent points - setting out of simple curve by offset and Rankines methods - obstructions and elimination in curve ranging - compound curve - problems. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Punmia B C, Ashok K Jain, Arun K Jain , "Surveying", 16<sup>th</sup> Edition, Laxmi Publications (P) Ltd., New Delhi, 2016.
2. Chandra A M , "Plane Surveying", 3<sup>rd</sup> Edition, New Age International (P) Ltd., New Delhi, 2016.

#### REFERENCES:

1. Duggal S K , "Surveying", 4<sup>th</sup> Edition, Tata McGraw Hill Publishing Company Ltd., New Delh, 2013.
2. Bannister A, Raymond S, Baker R , "Surveying", 7<sup>th</sup> Edition, Pearson Education Ltd., India, 2012.
3. Kanetkar T P, Kulkarni S V , "Surveying and Levelling", 23<sup>rd</sup> Edition, Pune Vidyarthi Griha Prakashan, Pune, 1993.

### 190306 ECONOMICS FOR ENGINEERS

3 0 0 3

**INTRODUCTION** : Definition – Nature and Scope – Central Problems of an Economy – Positive and Normative Economics– Micro Economics and Macro Economics, Significance of Economics, Economic Assumptions. (9)

**THEORY OF CONSUMER BEHAVIOR** : Utility — Indifference Curve Analysis - Properties, Consumer's Budget Line - Demand Analysis: Demand Function and Law of Demand, Elasticity of Demand. Demand forecasting using Econometric Techniques. Supply— Factors Affecting Supply, Market Equilibrium Price, Consumer Surplus. (9)

**PRODUCTION, COST AND REVENUE** : Production Function, Total Product, Average Product and Marginal Product, Returns to Scale. Costs, Nature of Costs, Short-run and Long-run Cost Curves, Revenue concepts. (9)

**MARKET STRUCTURE** : Types of Markets - Perfect Competition — Characteristics — Imperfect Competition: Monopoly – Monopolistic Competition – Oligopoly and Duopoly - Price Discrimination and Product Differentiation under Different Markets — Price and Output Determination in Short run and Long run and profit maximization. (9)

**PERFORMANCE OF AN ECONOMY (MACRO ECONOMICS)** : Demand and Supply of Money — Quantity Theory of Money, Banking — Functions of Commercial Banks and Central Bank — Inflation — Causes — Control Measures — National Income — Concepts — Methods of Calculating National Income — Problems in Calculating National Income. (9)

**Total L: 45**

#### TEXT BOOKS:

1. Varian H.R. , "Intermediate Microeconomics", East– West Press, New Delhi, 2014.
2. Dewett.K.K, Navalur. M.H. , "Modern Economic Theory", S. Chand, New Delhi, 2015.

#### REFERENCES:

1. William A, McEachern, Simrit Kaur , "Micro ECON", Cengage Learning, Noida, 2013.
2. William A, McEachern, Indira A. , "Macro ECON", Cengage Learning, Noida, 2014.
3. Deepashree , "Principles of Economics", Ane Books Pvt Ltd, New Delhi, 2010.
4. Dwivedi , "Essentials of Business Economics", Vikas Publishing House Pvt Ltd, New Delhi, 2010.

### 19C310 STRENGTH OF MATERIALS LABORATORY

0 0 2 1

1. Tension Test on Metals - Studying the stress strain characteristics - determining the characteristics ductility — resilience — toughness
2. Hardness Test on Metals - Determination of Brinell , Vicker and Rockwell Hardness numbers
3. Cupping Test on Metal Sheets - Plotting the Load - Deformation characteristics curve, determining the Cupping load and Cupping number
4. Impact Test on Metals - Determination of impact strength of metal rods by conducting the Charpy and Izod Impact tests
5. Tests on Compression and Tension Helical Springs - Plotting the Load - deformation characteristics curve, determining the stiffness, shear stress, modulus of rigidity energy
6. Compression, Bending and Tension Tests on Wood - Determination of tensile and compressive strengths - Plotting of Load - Deflection Characteristics curve of wooden beam — Determination of Young's Modulus, Modulus of Rupture
7. Torsion Test on shafts - Plotting of Torque and angle of twist characteristics curve, determination of shear stress, modulus of rigidity, energy stored
8. Deflection Test on Beams - Plotting of Load deflection characteristics curve, determination of Young's Modulus -

- Verification of Maxwell's Reciprocal law
9. Shear Test on Metal rods - Determination of Direct Shear Strength for Single Shear and Double Shear conditions
  10. Compression Test Determination of Compressive Strength of Concrete cube and Brick.

**Total P: 30**

**REFERENCES:**

1. Department of Civil Engineering , "Strength of Materials Laboratory Manual", PSG College of Technology, Coimbatore, 2019.

**19C311 SURVEY PRACTICE**

**0 0 4 2**

**CHAIN SURVEYING, COMPASS SURVEYING AND LEVELLING:**

1. Study of Instruments
2. Chain Surveying - Cross staff surveying
3. Compass traversing
4. Differential leveling (24)

**THEODOLITE SURVEYING, TACHEOMETRIC SURVEYING AND SETTING OUT WORKS:**

1. Measurement of horizontal angles by method of repetition and method of reiteration
2. Theodolite traversing
3. Trigonometrical levelling - Single plane method
4. Stadia tacheometry
5. Subtense bar tacheometry
6. Setting out works - Simple circular curve
7. Demonstration of Advanced Total Station and Global Positioning System (36)

**Total P: 60**

**REFERENCES:**

1. Department of Civil Engineering, "Survey Practice Laboratory Manual", PSG College of Technology, Coimbatore, 2019.

**19K312 ENVIRONMENTAL SCIENCE**

**2 0 0 0**

**INTRODUCTION TO ENVIRONMENT :** Environment - Definition, scope and importance. Types and composition of atmosphere —particles, ions and radicals. Ozone layer- significance, formation and depletion. Ecosystems- Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats — India as a mega-diversity nation — hotspots of biodiversity — endangered and endemic species of India —conservation of biodiversity. (6)

**ENERGY RESOURCES :** Introduction — National and International status- exploitation - sustainable strategies- Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines. Supporting renewable energy resources - tidal –geothermal - hydroelectric. (6)

**ENVIRONMENTAL POLLUTION :** Definition — Sources, causes, impacts and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards (h) RF hazards - Role of an individual in prevention of pollution. **DISASTER MANAGEMENT:** Floods, earthquake, cyclone and landslides —Case studies, consequences and rescue measures. (6)

**WASTE MANAGEMENT :** Wastewater - Characteristics of domestic and industrial wastewater - COD and BOD — Various stages of treatment — primary, secondary, tertiary treatment-Biological and advanced oxidation processes. Solid waste management — Characteristics of municipal solid waste(MSW), biomedical, automobile and e-wastes and their management –landfills, incineration, pyrolysis, gasification and composting. (6)

**SOCIAL ISSUES AND THE ENVIRONMENT** : Environmentally Sustainable work practices- Rain water harvesting — Role of non-governmental organizations. Human ethics and rights- impact on environment and human health — role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000. Legislation- Environment protection act — Air (Prevention and Control of Pollution) act — Water (Prevention and control of Pollution) act—Wildlife protection act—Forest conservation act. (6)

**Total L: 30**

**TEXT BOOKS:**

1. Gilbert M.Masters , "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2004.
2. De A K , "Environmental Chemistry", New Age International P Ltd, New Delhi, 2006.

**REFERENCES:**

1. Benny Joseph , "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. KoteswaraRao MVR, "Energy Resources: Conventional & Non-Conventional", BSP Publications, New Delhi, 2006.
3. Deswal S and Deswal A, "A Basic Course in Environmental Studies", Dhanpat Rai and Co, New Delhi, 2004.

**SEMESTER - 4**

**19C401 PROBABILITY AND STATISTICS**

**2 1 0 3**

**PROBABILITY AND DISCRETE RANDOM VARIABLES** : Probability, axiomatic approach to probability, Baye's theorem , discrete random variables, probability distributions and probability mass functions, cumulative distribution functions, mean and variance, binomial, Poisson and geometric distributions. (6 + 3)

**CONTINUOUS RANDOM VARIABLES** : Continuous random variables, probability distributions and probability density functions, cumulative distribution functions, mean and variance, uniform, exponential, and normal distributions.(6 + 3)

**JOINT PROBABILITY DISTRIBUTIONS** : Two dimensional discrete and continuous random variables, marginal and conditional probability distributions, independence, covariance, correlation and linear regression. (6 + 3)

**STATISTICAL INFERENCE**: Point estimation - interval estimation — testing of hypotheses for means — large, small samples and matched pairs tests — testing of hypotheses for proportions, chi square test for goodness of fit and independence of attributes. (6 + 3)

**VARIANCE TESTS AND ANALYSIS OF VARIANCE** : Testing of Hypotheses for variances - analysis of variance completely randomized design, randomized block design. (6 + 3)

**Total L: 30 +T: 15 = 45**

**TEXT BOOKS:**

1. Douglas C. Montgomery and George C. Runger , "Applied Statistics and Probability for Engineers", Wiley India, New Delhi, 2018.
2. Richard A. Johnson , "Miller & Freund's, Probability and Statistics for Engineers", Prentice Hall, New Delhi, 2017.

**REFERENCES:**

1. Jay L. Devore , "Probability and Statistics for Engineering and the Sciences", Brooks/Cole, USA, 2015.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye , "Probability & Statistics for Engineers & Scientists", Pearson, New Delhi, 2016.
3. Robert V. Hogg, Elliot Tanis and Dale Zimmerman , "Probability and Statistical Inference", Pearson Education, USA, 2014.
4. Sheldon M Ross , "Introduction to Probability and Statistics for Engineers and Scientists", Academic press, USA, 2014.

**19C402 MECHANICS OF SOLIDS II**

**3 1 0 4**

**THICK CYLINDERS** : Thick cylinders — Lamé's equation — Hoop stress and radial stress distribution Simple cylinder-problems—compound cylinders—shrink fit—problems. (8 + 2)

**BENDING OF CURVED BEAMS AND UNSYMMETRICAL BENDING OF STRAIGHT BEAMS** : Curved beams — stresses due to bending by Winkler Bach theory — rectangular, trapezoidal, circular solid sections — crane hook problem. Symmetrical and unsymmetrical bending — bending stresses in beams subjected to unsymmetrical bending — principal axes and principal moments of inertia - change in direction of neutral axis — Simple problems. (10 + 3)

**COLUMNS AND STRUTS** : Columns—Behaviour of axially loaded short, medium and long column members—Buckling load — Euler's theory— Different end conditions—Rankine's formula—columns subjected to eccentric loading-problems. (7 + 2)

**THEORIES OF ELASTIC FAILURE AND TORSION OF THIN WALLED SECTIONS** : Maximum principal stress theory — Maximum principal strain theory— Maximum shear stress theory - Maximum strain energy theory— Maximum shear strain energy theory — Mohr's theory- simple problems- Shear centre of mono-symmetric open sections. Hollow thin walled open and closed torsion members, single and multi-connected cross-sections. (10 + 4)

**DEFLECTION OF DETERMINATE BEAMS** : Governing differential equation — Macaulay's method — Moment area method—conjugate beam method—Determinate beams problems—indeterminate beam problems. (10 + 4)

**Total L: 45 +T: 15 = 60**

**TEXT BOOKS:**

1. Hearn E J, "Mechanics of Materials", 3<sup>rd</sup> Edition, Butterworth-Heinemann, India, 2008.
2. Popov E P, Balan T A, "Engineering Mechanics of Solids", 2<sup>nd</sup> Edition, Pearson Education, India, 2015.

**REFERENCES:**

1. Boreis A P and Schmidt R J, "Advanced Mechanics of Materials", 6<sup>th</sup> Edition, John Wiley & Sons, India, 2018.
2. Bansal R K, "Text Book of Strength of Materials", 6<sup>th</sup> Edition, Laxmi Publications, Delhi, India, 2017.
3. Bedi D S, "Strength of Materials", 5<sup>th</sup> Edition, Khanna book publishing Co. Ltd., India, 2010.

## **19C403 HYDRAULICS AND HYDRAULIC MACHINERY**

**3 0 0 3**

**FLOW MEASUREMENT** : Velocity measurement - Pitot tube - Currentmeter - Discharge measurement — Orifices mouthpieces - notches and weirs - Rectangular - triangular - Cipolletti weir - submerged weir - Time of emptying reservoirs through orifices - mouthpieces and notches. (9)

**FLOW THROUGH PIPES** : Energy losses in pipes - Darcy Weisbach's formula - flow through pipes in series - flow through parallel pipes - flow through branched pipes - equivalent pipe - water hammer in pipes - Laminar flow through circular pipes - Hagen Poiseuille's equation - turbulent flow through circular pipes - Velocity distribution. (9)

**FLOW IN OPEN CHANNELS** : Types of flow in channels - velocity distribution - Chezy's formula - Manning's formula; Most economical channel section; Computation of specific energy and critical depth; hydraulic jump and backwater curves. (9)

**IMPACT OF JETS AND TURBINES** : Applications of momentum equation - Force exerted by fluid jet on stationary and moving curved vanes. - General layout of a Hydroelectric power plant - Classification of turbines - Specific speed and characteristic curves - Draft tube and cavitation. (9)

**PUMPS AND HYDRAULIC DEVICES** : Classification of pumps - Centrifugal pumps - multistage pumps - minimum speed to start the pump - specific speed and characteristic curves - reciprocating pumps - negative slip - Indicator diagram - functions of air vessels. Pressure booster pumps. - Hydraulic press - hydraulic accumulator - hydraulic intensifier and hydraulic ram - hydraulic jacks. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Ojha C.S.P, Chandramouli P.N, Berndtsson R, "Fluid Mechanics and Machinery", Oxford, New Delhi, 2010.
2. Modi P N and Seth S M, "Hydraulics and Fluid Mechanics", Raj sons Publications pvt ltd, New Delhi, 2017.

**REFERENCES:**

1. Subramanya K , "Flow in Open Channels", Tata McGraw Hill Publishing Company, 2007.
2. Kumar K.L , "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., 2009.
3. Ranauld Giles, Jack evett, Liu , "Schaum's Outline of Fluid Mechanics and Hydraulics", 2009.

**19C404 BASIC STRUCTURAL STEEL DESIGN****3 0 0 3**

**BASIC CONCEPTS OF STRUCTURES:** Structural form: Classification of structures based on function - material and shape , different structural systems and basic structural requirements : stability strength and stiffness. - **STRUCTURAL LOADS:** Dead load - live load - wind load - dynamic and seismic load - thermal load - **DESIGN CONCEPTS:** Design Process: Codes of practice -Working Stress Method - Limit State Method of Design - Probabilistic approach to design - load and resistance factor design. - Limit State Design Concepts - Introduction: Material - properties of steel - behavior- structural steel sections - Loads on Structures - load combinations - partial safety for materials - load safety factors. (12)

**DESIGN OF CONNECTIONS:** Need for connections - Bolted Connection: bearing type and slip critical - axially loaded - eccentrically loaded in plane and perpendicular to the plane. - Welded Connection: Types of welded connections - axially loaded - eccentrically loaded in plane and perpendicular to the plane. (9)

**DESIGN OF TENSION MEMBERS :** Behavior and Types of sections - strength based on gross and net area basis - net area calculation for bolts - shear lag and block shear - Design of Tension Members. (7)

**DESIGN OF COMPRESSION MEMBERS :** Behavior - Euler's equation - basis of IS Code formula - corrections for residual stresses - effective length calculation- selection and design of simple members - Built-up members - simple back to back- toe to toe sections - laced members - battened member - column splices. (10)

**COLUMN BASES :** Simple base - gusseted base - column bases subjected to moment and axial loads - design of anchor bolts. (7)

**Total L: 45****TEXT BOOKS:**

1. Jayagopal L S, Tensing D , "Design of Steel Structures", Vikas Publishing House Pvt Ltd., 2016.
2. Subramanian N , " Design of Steel Structures", Oxford University Press, 2008.

**REFERENCES:**

1. Reid E , "Understanding Buildings: A Multidisciplinary Approach", 1984., 1984.
2. Ariel Hanaor , "Principles of Structures", 1998., 1998.
3. Mario Salvadori , Robert Heller , "Structure in Architecture", Prentice Hall, 1967.
4. Duggal S K , " Limit State Design of Steel Structures", Tata McGraw Hill Education Private Limited, 2010.

**19C405 CONCRETE TECHNOLOGY****3 0 0 3**

**CONCRETE CONSTITUENTS :** Composition and properties of cement - Hydration of cement - Tests on Physical properties of cement - Other types of cements- composition, properties and uses with BIS specifications - Classification of Aggregates - Characteristics affecting Concrete Properties - Tests on aggregates - M sand BIS specifications - Water - Quality of water for use in concrete. (10)

**PROPERTIES OF FRESH CONCRETE :** Workability - Factors affecting workability and their control - Batching, Mixing and Transport - Placing, Compacting and Finishing - Concrete Curing and Formwork Removal - Slump loss - Significance, causes and control - Segregation and Bleeding - Early Volume change - Setting time– Temperature of concrete - Testing and Control of Concrete Quality. (8)

**PROPERTIES OF HARDENED CONCRETE :** Strength tests on hardened concrete - stress strain characteristics - Determination of modulus of Elasticity - Non destructive testing - Permeability - Frost action - Effect of fire - Deterioration of concrete by chemical reactions - Sulphate attack - Alkali-Aggregate reaction - Corrosion of embedded steel in concrete - Concrete in Marine Environment - Thermal Properties of concrete - Resistance to abrasion and cavitation. (9)

**PROPORTIONING OF CONCRETE MIX** : Significance and Objectives - Principles of mix proportioning - Basic considerations - Various methods of proportioning - Statistical Quality control of concrete - Mix Design - BIS Method as per IS 10262-2019 - ACI Method. (8)

**ADMIXTURES AND SPECIAL CONCRETES** : Chemical Admixtures-Significance - Nomenclature, Specifications and Classifications - Surface-Active chemicals - Set-Controlling Chemicals - Mineral Admixtures-Significance - Classification - Natural pozzolanic materials - By-product materials - Applications - Special concretes - Lightweight concrete - High strength concrete - Self-consolidating concrete - High Performance concrete - Shrinkage- compensating concrete - Fibre reinforced concrete - Concrete containing polymers - Bacterial concrete - Heavyweight concrete for radiation shielding - Mass concrete - Roller compacted concrete. (10)

**Total L: 45**

**TEXT BOOKS:**

1. Shetty MS , "Concrete Technology- Theory and Practice", 8<sup>th</sup> Edition, S Chand & Company private. Ltd, 2015.
2. Santhakumar.A.R , "Concrete Technology", 3<sup>rd</sup> Edition, Oxford University Press, New Delhi, 2018.

**REFERENCES:**

1. Kumar Mehta P, Paulo J M Monteiro , "Concrete - Microstructure, Properties and Materials", 3<sup>rd</sup> Edition, Mc Graw- Hill private Ltd, NewDelhi, 2017.
2. Neville A M, Brooks J J , "Concrete Technology", 2<sup>nd</sup> Edition, Prentice Hall, 2010.
3. Job Thomas , "Concrete Technology", 1<sup>st</sup> Edition, Cengage Learning India Pvt. Ltd, New Delhi, 2015.
4. IS 10262:2019 , "Concrete Mix Proportioning-Guidelines", 2<sup>nd</sup> Edition, Bureau of Indian Standards, NewDelhi, 2019.

## **19C406 HIGHWAY AND RAILWAY ENGINEERING**

**3 0 0 3**

**HIGHWAY ENGINEERING INTRODUCTION, PLANNING AND DEVELOPMENT** : History of Road Development -Highway Development in India - Jayakar Committee Recommendations and Realisations - Twenty-year Road Development Plan - On-going Highway Development Programmes at National Level - Institutions for Highway Development at National level - Principles of Highway Economics and financing - Requirements of Ideal Alignment Factors Controlling Highway Alignment - Engineering Surveys for Alignment. (8)

**HIGHWAY GEOMETRY AND DESIGN** : Classification and Cross Section of Urban and Rural Roads (IRC) - Highway Cross Sectional Elements [IRC Standards] - Horizontal Alignment - Horizontal Curves- Super elevation - Widening of Pavements on Horizontal Curves and Transition Curves - Vertical Alignments - Gradients, Summit and Valley Curves - Sight Distances and factors affecting Sight Distances - Geometric Design of Hill Roads [IRC Standards Only] (10)

**HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE** : Desirable Properties and Testing of Highway Materials - Soil — Soil stabilized roads - Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test - Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. - Construction Practice - Water Bound Macadam Road, Bituminous Road and Concrete Road - Joints and filler - Highway Drainage - road side development and Arboriculture . (8)

**RAILWAY ENGINEERING INTRODUCTION, PLANNING AND DESIGN** : Railroad history - transportation in India today and its significance - Railroad organizations - Other Rail Transportation (ie) Intra-city, Suburban railways, RTS, MRTS, LRTS, Monorail, Sky buses - Railway track (Permanent way) its components and their functions - Gauge, tilting of rails - coning of wheels and theory of coning - Rails, Rail fastenings, Creep of rails - Sleepers - Ballasts and Ballast less tracks. - Track alignment: Engineering surveys for track alignment - Obligatory points - Conventional methods and Modern methods - Geometric design of Railway Tracks: Gradient, Horizontal curve, super elevation, Transition curves, Summit Curves. (10)

**RAILWAY TRACK CONSTRUCTION AND MAINTENANCE** : Points and crossing - Signaling and interlocking Stations and Equipment - Yards and equipments - Track maintenance. (9)

**Total L: 45**



**TEXT BOOKS:**

1. Khanna.K. and Justo.C.E.G , "HighwayEngineering", 10<sup>th</sup> Edition, Nem Chand & Bros, 2010.
2. Arora S P and Saxena S C , "Text Book of Railway Engineering", 8<sup>th</sup> Edition, Dhanpat Rai & sons, New delhi, 2015.

**REFERENCES:**

1. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications, Chennai, 2010.
2. Kadiyali.L.R , "Principles and Practice of Highway Engineering", Khanna Publishers, Delhi,2016.
3. Venkatramaiah C , "Transportation Engineering: Highway Engineering - Vol 1", Universities Press, 2016.
4. Brockenbrough R L and Boedecker K J , "Highway engineering handbook", Mcgraw-Hill, Inc,2003.
5. Satishchandra and Agarwal MM , "Railway Engineering", Oxford University Press, 2013.

**19C410 HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY****0 0 2 1****HYDRAULICS LABORATORY :**

1. Determination of Co-efficient of discharge of a mouthpiece.
2. Determination of Co-efficient of discharge of a rectangular notch
3. Determination of Co-efficient of discharge of a V-notch.
4. Determination of Co-efficient of discharge of a Venturimeter.
5. Determination of Co-efficient of discharge of an orificemeter. (12)

**HYDRAULIC MACHINERY LABORATORY :**

1. Determination of pressure loss in pipe flow.
2. Performance study of jet on vane apparatus.
3. Performance of Pelton Turbine and Francis Turbine – Operating characteristics.
4. Study on Performance Characteristics of centrifugal pump.
5. Study on Performance Characteristics of reciprocating pump. (18)

**Total P: 30****REFERENCES:**

1. Laboratory Manual prepared by the Department of Civil Engineering , 2019.

**19C411 CONCRETE TECHNOLOGY AND HIGHWAY LABORATORY****0 0 4 2****PHYSICAL PROPERTY TESTS ON CONCRETE AND HIGHWAY MATERIALS:**

1. Tests on Cement: Fineness — soundness - standard consistency - initial & final setting times-compressive strength.
2. Tests on Fine aggregate: Specific gravity- bulk density - sieve analysis-bulking water absorption — surface moisture content.
3. Tests on Coarse Aggregate: Specific gravity- bulk density - sieve analysis — water absorption-Grading zone — abrasion value — shape test - specific gravity- bulk density - aggregate crushing strength — aggregate impact — stripping value.
4. Tests on Bitumen: Specificgravity—Penetration—Ductility-Viscosity—Softening point—flash and fire point test (30)

**TESTS ON FRESH AND HARDENED CONCRETE PROPERTIES :**

1. Mix Design as per IS10262- 2019 IS 383:2016and IS 456 - 2000.
2. Workability Tests: slump test- compaction factor — Vee bee consistometer. Flow test
3. Hardened concrete properties: Compressive strength-cube - cylinder - split tensile strength - modulus of rupture-static young's modulus.
4. Test on subgrade: CBR – Benkelman beam – (Demonstration only) (30)

**Total P: 60**

**REFERENCES:**

1. Laboratory manual prepared by the department of Civil Engineering , PSG College of Technology, Coimbatore, 2019.

**19O412 INDIAN CONSTITUTION****2 0 0 0**

**INTRODUCTION** : Evolution of Indian Constitution; Significance of Constitution; Composition; Preamble and its Philosophy. (4)

**RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES** : Fundamental Rights- Writs and Duties, Directive Principles of State Policy. (6)

**COMPOSITION OF PARLIAMENT AND FEDERALISM** : : Union Government, President and Vice President, Houses of the Parliament and their functions; Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States. (8)

**BILLS AND CONSTITUTION AMENDMENT PROCEDURE** : Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. (6)

**JUDICIARY** : Supreme Court and High Court; Functions and powers, Judicial Review. (6)

**Total L: 30****TEXT BOOKS:**

1. Subash C. Kashyap , "Our Constitution", 5<sup>th</sup> Edition, NBT, India, New Delhi, 2015.
2. Basu D D , "Introduction to the Constitution of India", 20<sup>th</sup> Edition, Prentice Hall of India, New Delhi, 2011.

**REFERENCES:**

1. Brijji Kishore Sharma , "Introduction to the Constitution of India", 8<sup>th</sup> Edition, Prentice Hall of India, New Delhi, 2017.
2. Hoshiar Singh , "Indian Administration", 1<sup>st</sup> Edition, Pearson Education, New Delhi, 2011.
3. Jain M C , "The Constitution of India", 5<sup>th</sup> Edition, State Mutual Book & Periodical Service, Limited, New Delhi, 1988.
4. Shukla V N , "Constitution of India", 13<sup>th</sup> Edition, Eastern Book Company Limited, New Delhi, 2017.

**19Q413 SOFT SKILLS DEVELOPMENT****0 0 2 1****SOFT SKILLS DEVELOPMENT:**

1. Body Language and Professionalism
2. Interpersonal skills
3. Goal setting
4. Impression Management
5. Team Building
6. Time Management
7. Stress Management
8. Convincing Skills
9. Motivation
10. Change Management
11. Communication Confidence
12. Group discussion basics
13. Personal Interview basics
14. Resume writing

**Total P: 30****REFERENCES:**

1. Jeff Butterfield , "Soft Skills for Everyone", 6<sup>th</sup> Edition, Cengage Learning, Delhi, 2015.
2. Rao M S , "Soft Skills - Enhancing Employability", LK International Publishing House, New Delhi, 2011.

## SEMESTER - 5

### 19C501 STRUCTURAL ANALYSIS I

3 1 0 4

**FUNDAMENTAL CONCEPTS AND ENERGY METHODS :** Introduction - Definition and Determination of Static and Kinematic Indeterminacy - beams, trusses and frames - degrees of freedom - fundamental equations for Structural Analysis - principle of superposition - basic methods of Structural Analysis - Work Energy Principles - principle of virtual displacements - principle of stationary potential energy - principle of complementary energy - principle of virtual forces - Castigliano's first and second theorems - Engerssor's first and second theorems – Betti Maxwell's law - application to statically determinate beams, trusses and frames. (14 + 4)

**FORCE METHOD :** Consistent deformation method - application to trusses subjected to loads & fixed beams - application of Clapeyron's theorem of three moments for continuous beams - Plane rigid frames (with one degree of indeterminacy only) subjected to simple loads - Load and settlement of supports. (8 + 3)

**ARCHES AND STIFFENING GIRDERS :** Analysis of three hinged arches and two hinged arches - normal thrust and radial shear in arches - temperature effect - analysis of three hinged stiffening girders - suspension bridges. (6 + 2)

**INFLUENCE LINES FOR DETERMINATE BEAMS AND TRUSSES:** Effect of rolling loads - Description of Influence line - Influence lines for support reactions - shear force and bending moments in beams. - Rolling loads: single, two and a series of concentrated loads - rolling uniformly distributed load longer and shorter than the span - Maximum Bending Moment Diagram - Absolute maximum bending moment - Influence lines for statically determinate plane trusses. (12 + 4)

**INFLUENCE LINES FOR ARCHES AND CONTINUOUS BEAMS :** Influence lines for three hinged parabolic and semi circular arches subjected to loads - Influence lines for horizontal reaction, normal thrust, radial shear and bending moment - Influence lines for two hinged arches - Muller Breslau's Principle - Influence lines for continuous beams with one degree of indeterminacy only. (5 + 2)

**Total L: 45 +T: 15 = 60**

#### TEXT BOOKS:

1. Punmia B C, Jain A K and Jain A K , "Strength of Materials and Theory of Structures - Vol. 2", Laxmi Publications, NewDelhi, 2005.
2. Hibbeler R C , "Structural Analysis", Pearson Prentice Hall, New Jersey, 2012.

#### REFERENCES:

1. Leet K M , Uang C M , "Fundamentals of Structural Analysis", Tata McGraw Hill Publishing Co., 2003.
2. Alan Williams , "Structural Analysis in theory and Practice", Butterworth-Heinemann Publications, 2008.
3. Devdas Menon , "Structural Analysis", Narosa Publications, NewDelhi, 2018.
4. Rajasekaran S and Sankarasubramanian G , "Computational Structural Mechanics", Prentice Hall of India Private Ltd, NewDelhi, 2001.

### 19C502 DESIGN OF RC ELEMENTS

3 0 0 3

**DESIGN OF BEAMS :** Introduction on various design philosophies - analysis and design of RC rectangular and flanged beams. (9)

**DESIGN OF SLABS AND LIMIT STATE OF SERVICEABILITY :** Design of one-way and two-way slabs - design of one-way continuous slab - estimation of deflection of simple flexural members - estimation of crack width of flexural members. (9)

**DESIGN FOR BOND, ANCHORAGE, SHEAR AND TORSION :** Behaviour of RC members in bond and anchorage - design requirements and detailing of joints - behaviour and design of RC beams in shear - design of RC beams for combined bending, shear and torsion. (9)

**DESIGN OF RC COLUMNS** : Design of short columns for axial, uniaxial and biaxial bending - RC slender Columns (Design Principles only). (9)

**DESIGN OF RC FOOTINGS** : Design of isolated footings - design of combined rectangular, trapezoidal and strap beam footings (9)

**Total L: 45**

**TEXT BOOKS:**

1. Varghese P C , "Limit State Design of Reinforced Concrete", II, Prentice Hall of India Ltd, New Delhi, 2010.
2. Sinha S N , "Reinforced Concrete Design", III, Tata McGraw-Hill Publishing Co., Ltd, New Delhi, 2014.

**REFERENCES:**

1. Unnikrishnan Pillai S and Devdas Menon , "Reinforced Concrete Design", III, Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2010.
2. Krishna Raju N and Pranesh R N , "Reinforced concrete design — IS 456 — 2000 Principles and Practice", I, New Age International Publishers, New Delhi, 2014.
3. James Wight, James MacGregor , "Reinforced Concrete Mechanics and Design", VI, Prentice Hall, New Jersey, 2012.
4. N.Subramanian , "Design of Reinforced Concrete Structures", 1<sup>st</sup> Edition, Oxford University Press, 2014.

### **19C503 GEOTECHNICAL ENGINEERING I**

**3 0 0 3**

**BASIC DEFINITIONS, RELATIONSHIP AND CLASSIFICATION BASED ON PHYSICAL PROPERTIES** : Phase diagrams, Basic definitions and derivations of relations, Numerical examples. - Physical properties including colour, grain shape, grain size distribution and Atterberg limits - Bureau of Indian Standards classification. (13)

**EFFECTIVE STRESS CONCEPT AND PERMEABILITY** : Soil water, Capillarity in soils, types of head, state of stress in soil mass, Terzaghi's effective stress law - Flow of water in soils, Darcy's law, Permeability, Constant and falling head permeability tests, factors affecting permeability. (8)

**SEEPAGE THROUGH SOILS AND COMPACTION** : Seepage, critical hydraulic gradient, quick sand phenomenon - effect of seepage force on the state of stress in a soil mass - properties and uses of flow nets - Factors influencing soil compaction, Laboratory compaction tests, dry density and moisture content relationship, field compaction, compaction control (9)

**STRESS DISTRIBUTION AND CONSOLIDATION** : Boussinesq's expression for point loads and its extension to uniformly distributed loads - Newmark's chart, approximate methods, examples - Compressibility of soil, measurement of compressibility characteristics, e-log p curve - Various terms involved - Terzaghi's one dimensional consolidation theory, Evaluation of coefficient of consolidation, examples (9)

**SHEARING CHARACTERISTICS OF SOILS** : Review of principal stresses, planes and Mohr's stress circle - Mohr- coulomb theory - Measurement of shear strength in the laboratory - Influence of Drainage conditions on the shear strength parameters - Shear characteristics of granular materials and saturated cohesive soils – Factors influencing shear strength (6)

**Total L: 45**

**TEXT BOOKS:**

1. Palanikumar M, "Soil Mechanics", PHI Learning Private Limited, Delhi, 2018.
2. Purshothama Raj P , "Soil Mechanics and Foundation Engineering", Pearson, New Delhi, 2012.

**REFERENCES:**

1. Coduto D P , "Geotechnical Engineering", PHI Learning Private Limited, Delhi, 2013.
2. Compendium of Indian Standards on Soil Engineering , "SP 36. (Part 1): 1987", Bureau of Indian Standards, New Delhi, 1987.

## 19C504 DESIGN OF STEEL STRUCTURES

3 0 0 3

**LATERALLY RESTRAINED BEAMS** : Classification of sections — simple and compound sections — calculation of plastic modulus of sections — flexural strength of beams - design considerations — behavior of web under shear — shear check — deflection check - bearing strength of web — buckling strength of web - web buckling — web crippling. (7)

**LATERALLY UNRESTRAINED BEAMS** : Behavior — basic equations — effective length — position of loads — compound beams — plate girders with mono symmetric cross section. - (5)

**WELDED PLATE GIRDER**: Behavior — design of flanges — design of webs — simple post critical and tension field actions—design of web under concentrated loads—design of intermediate stiffener—load bearing—end stiffener web and flange splices. - detailing. (9)

**GANTRY GIRDERS AND ROOF TRUSSES** : Types of cranes — mono rail cranes — design of gantry girders with capping channels — design of connections - stiffeners. Roof trusses: metal roof sheets — design of roof and cladding purlins — design of built-up purlins — loads and load combinations — double plane trusses - design of strut and tie members—bracing design—design of connections—base connections-detailing. (12)

**BEAM COLUMNS AND BOLTED BEAM CONNECTIONS** : Basic theory — sections under combined bending and axial loads — section strength for uni-axial and bi-axial bending — overall member strength — magnification factor — equivalent factor for uniform moment — structure of interaction equation — in-plane buckling — out of plane buckling - design buckling strength as column — columns under biaxial moment — combined tension and bending — member strength, Bolted beam connections: Simple beam connections - framed connection, unstiffened and stiffened connection, Moment resistant connections — split beam connection, bracket connection — detailing. (12)

**Total L: 45**

### TEXT BOOKS:

1. Subramanian N , "Design of Steel Structures-Limit States Method", 2<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2017.
2. Jayagopal L S & Tensing D , "Design of Steel Structures", 1<sup>st</sup> Edition, Vikas Publishing House Pvt Ltd, New Delhi, 2016..

### REFERENCES:

1. Trahir N S, Nethercot D A and Bradford M A , "Behaviour & Design of Steel Structures to EC3", 4<sup>th</sup> Edition, 2008.
2. Duggal S K , "Design of Steel Structures", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2007.
3. Krishna Raju N , "Structural Design and Drawing (Reinforced Concrete and Steel)", University Press, Hyderabad,, 2008.
4. IS 800 — 2007 , "General Construction in Steel - Code of Practice, (Third Revision)", Bureau of Indian Standards, New Delhi, 2007.

## 19C505 WATER SUPPLY ENGINEERING

3 0 0 3

**WATER SUPPLY SYSTEM AND WATER DEMAND** : Need for protected water supply - objectives of water supply system - Factors affecting per capita consumption, fire demand, fluctuations in rate of consumption, population forecasting - Design periods for water supply components - Conveyance of water , types of conduits, relative merits. Pipe corrosion - mechanism and prevention. Hydraulic design of pipes - Laying, joining and testing of pipes, appurtenances - Intake structures and their types. (10)

**WATER QUALITY AND PRIMARY TREATMENT OF WATER** : Impurities in water - causes - effects / significance - analysis tests - bacteriological analysis - Water borne diseases - Standards of water quality - Treatment flow charts - Principles of coagulation, flocculation and sedimentation - Design principles of Flash mixer - Design and drawing (Line sketch) of Flocculator and Sedimentation tank. (10)

**WATER TREATMENT BY FILTRATION AND OTHER METHODS** : Principles of Filtration - Classification - constructional

and operational features of slow sand filters and rapid sand filters - Design and drawing (Line sketch) of slow sand filters and rapid sand filters - Disinfection - methods and disinfectants - disinfection devices - chlorination - action of chlorine - different methods - Advanced water treatment - taste and odour control, iron and manganese removal, water softening, fluoridation and defluoridation. Demineralization — reverse osmosis - Residue Management. (12)

**DISTRIBUTION SYSTEM OF WATER :** Requirements of distribution system - Distribution network layouts - Analysis by Hardy Cross method and Equivalent Pipe method — introduction to computer applications - Service reservoirs - functions, classification - service reservoir design - Leakage detection and prevention - metered and unmetered water supplies - Necessity of pumping in water supply - types of pumps - selection of pump - calculation of head and power - economical diameter of pumping main (8)

**WATER SUPPLY AND PLUMBING IN BUILDINGS :** Service connection to buildings - drainage layout - principles governing drainage - plumbing components and design - traps and fittings - water seal - classification of plumbing systems - choice -plumbing design, IS Code provisions-IS 1172 : 1983, IS 2065 : 1983 (5)

**Total L: 45**

**TEXT BOOKS:**

1. Punmia B.C, "Environmental Engineering Vol. I", Lakshmi Publications (P) Ltd., New Delhi, 2014.
2. Garg, S.K, "Environmental Engineering Vol. I", Khanna Publishers, New Delhi, 2013.

**REFERENCES:**

1. Birdie G S and Birdie J S, "Water Supply and Sanitary Engineering", 5<sup>th</sup> Edition, Dhanpat Rai and Sons, New Delhi, 2014.
2. Mcghee Terrence, "Water Supply and Sewerage", Sixth, McGraw Hill Education, 2013. CPHEEO, "Manual on Operation and Maintenance of Water Supply Systems", Central Public Health And Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, New Delhi, 2005.

## **19C510 GEOTECHNICAL ENGINEERING LABORATORY**

**0 0 2 1**

**PHYSICAL PROPERTIES OF SOIL :**

1. Specific gravity of solids
2. Relative Density of sand
3. Sieve Analysis on sand
4. Liquid limit and Plastic limit on fine grained soil
5. Shrinkage limit of fine grained soil
6. Wet sieve analysis
7. Moisture content using conical flask/ pycnometer (13)

**ENGINEERING PROPERTIES OF SOIL :**

1. Vane shear test
2. Permeability test
3. Direct Shear test
4. Unconfined Compression test
5. Light compaction test
6. Field density by sand replacement method
7. Demonstration of consolidation test and triaxial test (17)

**Total P: 30**

**REFERENCES:**

1. Department of Civil Engineering, "Soil Mechanics Laboratory Manual", PSG College of Technology, Coimbatore, 2019.
2. SP 36 (Part 1) - 1987, "Compendium of Indian Standards on Soil Engineering, Part 1 Laboratory Testing of Soils for Civil Engineering Purposes", Bureau of Indian Standards, New Delhi, 1987.

## 19C511 INDUSTRIAL VISIT

0 0 4 2

STUDENTS WILL UNDERGO INDUSTRIAL VISIT, PREPARE REPORTS CONSISTING OF OBSERVATIONS WITH THEIR COMMENTS AND SUBMIT

Total P: 60

## 19Q513 BUSINESS AND MANAGERIAL COMMUNICATIONS

0 0 2 1

### BUSINESS AND MANAGERIAL COMMUNICATIONS :

1. Advanced Group discussion
2. Advanced Resume writing
3. Mock Group discussion
4. Advanced Personal Interview
5. Mock Personal Interview
6. Cracking special Interviews
7. Essential Grammar for Placements
8. Vocabulary for Placements
9. Email writing
10. Paragraph writing
11. Essay writing

Total P: 30

### REFERENCES:

1. Priyadarshi Patnaik , "Group Discussion and Interview Skills", Cambridge, New Delhi, 2011.
2. Hari Mohan Prasad, Rajnish Mohan , "How to Prepare for Group Discussion and Interview", 2<sup>nd</sup> Edition, Tata McGrawhill, New Delhi, 2009.

## SEMESTER – 6

### 19C601 STRUCTURAL ANALYSIS II

3 1 0 4

**SLOPE DEFLECTION METHOD TO BEAMS AND FRAMES :** Displacement method concept — Slope Deflection equations — Fixed End moments - Application to Statically indeterminate beams and frames - Symmetric structure subjected to symmetric and anti-symmetric loadings - Effect of temperature, settlement - Deformed shape , Bending Moment and Shear Force Diagrams and axial force diagrams. (8 + 3)

**MOMENT DISTRIBUTION METHOD TO BEAMS AND FRAMES :** Basic concepts — Stiffness factor, distribution factor and carry over factors - Single span beams with different support conditions — Fixed End Moments - Moment Distribution in Continuous Beams - Portal frames with and without side sway - Deflected shape, bending moment, shear force and thrust diagrams - symmetric structure subjected to symmetric and anti-symmetric loadings - Naylor's distribution. (9 + 3)

**APPROXIMATE METHODS OF ANALYSIS :** Multi-storey frames-Analysis using substitute frames-gravity load- loading pattern for maximum moments; - Methods of lateral load analysis-portal method –cantilevermethod. (7 + 2)

**FLEXIBILITY METHOD :** Flexibility matrix-Definition — Application of Principle of Superposition — Properties - Formulation of Structure Flexibility matrix - Application to Two Degree of Freedom systems — Structure and element co-ordinates — Transformation of forces - Structure flexibility in terms of element flexibility-  $[a]=[b]T[\alpha][b]$  - Forces acting at coordinates and not acting at co-ordinates - Determination of Displacements - Application to trusses, beams and frames (11 + 4)

**STIFFNESS METHOD** : Principle of superposition of displacements - one, two degree of freedom systems - structure stiffness in terms of element stiffness - Formulation of structure stiffness matrix from element stiffness matrix using  $[K] = [\beta]T [K] [\beta]$  - application to plane trusses, beams and plane frames - determinate and indeterminate structures - forces not acting at co-ordinates - Effect of Temperature, lack of fit - Static condensation technique. (10 + 3)

**Total L: 45 +T: 15 = 60**

**TEXT BOOKS:**

1. Rajasekaran S and Sankarasubramanian G , "Computational Structural Mechanics", Prentice Hall of India Pvt. Ltd, New Delhi,, 2015..
2. Hibbeler R C , "Structural Analysis", 8<sup>th</sup> Edition, Pearson Prentice Hall, 2012.

**REFERENCES:**

1. Leet K M and Uang C M , "Fundamentals of Structural Analysis", 4<sup>th</sup> Edition, Tata McGraw Hill Publishing Co, 2010.
2. Punmia B C, Jain A K and Jain A K. , "Strength of Materials and Theory of Structures — Vol.2", Laxmi Publications, New Delhi,, 2014.
3. Devdas Menon , "Structural Analysis", Narosa Book Distributors Pvt. Ltd, 2011.
4. McGuire W, Gallagher R H and Ziemann R , "Matrix Structural Analysis", 2<sup>nd</sup> Edition, John Wiley & Sons, 2015.

## **19C602 CONSTRUCTION PROJECT MANAGEMENT**

**3 0 0 3**

**MANAGEMENT, PROJECT PLANNING & SCHEDULING** : Management objectives and functions, Application of management concepts - Different periods of planning, - Pretender data collection, analysis and report; Activity — time scheduling; - Charts for labor, staff, material and plant requirements; BOQ and cost estimates - Pre contract and Contract planning; Master Program. - Bar Chart scheduling CPM/ PERT Network — Activities, their duration and interdependence; - Construction of network diagram; activities and events; activity start and finish time both early and late; forward and backward pass; critical period and critical path; Float; - PERT - three time aspects and their identification based on statistical data and Beta distribution - Probability of achieving desired time targets for projects. (13)

**RESOURCE AGGREGATION AND LEVELLING** : Differentiate resource smoothing & leveling Resource aggregation as per early start time and initial histogram - Leveling of resources by manipulating activity start time according to float availability and late finish time and final histogram. (5)

**TIME COST OPTIMIZATION** : Direct cost and indirect cost and their relation to project duration — Normal and crash duration of activities and their corresponding cost - Crashing of network to optimize cost and duration of projects - Optimize assignment of tasks to groups of workmen and transport of materials from quarries to sites. (6)

**PROCEDURES OF CONTRACT, PAYMENT FOR WORK & COST CONTROL** : Tenders — aim, notice, tender documents, tender submission, opening, scrutiny, acceptance and award; - Contract Agreement — Principal clauses and conditions, types of contracts, their merit and suitability - Payment for works - Measurements, Running bills, deductions; Inventory of materials - Aims and scope of cost control — use of estimates, data, unit rate and standard rate as tools for cost monitoring - Systems of cost control based on accounting details of spends and periodicity of cost comparison (11)

**EQUIPMENT AND MACHINERY** : Classes of equipments according to work cycle and function performed; Modes of procuring equipment by rental, leasing and owning - Performance factors of earthmoving equipment — machine related, environment related and material related; Work and time cycle - Earth work calculation — mass curve, balancing cut and fill and optimizing haul distances and quantities by Mass Haul Diagram. (10)

**Total L: 45**

**TEXT BOOKS:**

1. Shrivastava U K , "Construction Planning and Management", Galgotia Publications Pvt. Ltd, New Delhi, 2000.
2. Ghattas R G and Sandra L Mckee , "Practical Project Management", Pearson Education (P) Ltd, New Delhi, 2003.

**REFERENCES:**

1. Punmia B C and Khandelval K K , "Project Planning and Control with PERT and CPM", Laxmi Publications,, 1993.
2. Vazirani and Chandola , "Construction Management and Accounts", Khanna Publishers,, delhi, 1989.



## 19C603 WASTE WATER ENGINEERING

3 0 0 3

**SEWERAGE SYSTEM** : Importance and scope of sanitary engineering — Sewerage system — classification of sewerage systems — relative merits and situations for adoption - Sources of wastewater — Quantity of sanitary sewage — fluctuations in flow and their significance - Storm runoff estimation - factors affecting storm water drainage—empirical and rational methods— time of concentration - Hydraulics of sewer flow — Hydraulic element charts - Computer applications — Design of storm sewers — surface drains for storm water - Shapes and materials of sewers - Non-circular sections - Laying, jointing and testing of sewers - Sewer appurtenances (10)

**SEWAGE CHARACTERISTICS AND TREATMENT SYSTEM** : Wastewater characteristics and significance — Decomposition — cycles of decomposition — analysis of sewage — dissolved oxygen — Biochemical Oxygen Demand — Test for 5 day BOD — significance and limitations - Relative stability — Sewage sampling — population equivalent of industrial effluents - Selection of unit operation and process - Objectives and principles of preliminary, primary treatments - Principle and Design of Preliminary Treatments: Screens, skimming tank – grit chamber -proportional flow weir - Sedimentation types—Principle and Design of Primary sedimentation tanks (10)

**SECONDARY TREATMENT** : Principle of biological treatment system - Suspended growth and attached growth systems - Activated sludge process and its types — working principle and design of conventional activated sludge process - Tickling Filters (conventional and high rate) — working principle and design of Tickling Filters - Oxidation / stabilization ponds — aerobic and facultative ponds - Brief outlines of Intermittent sand filters and contact beds - Roughing Filter — Rotating biological contactors - UASB. - Design and Drawing (Line sketch) of Septic Tank, IS Code provisions — septic tank effluent disposal — field test soil permeability for design of dispersion trench/ soakpit. (12)

**ADVANCED TREATMENT AND SLUDGE TREATMENT** : Need for advanced treatment — Methods - Sludge treatment Objectives - Sludge characterization — Weight volume relationship - Thickening - gravity thickener - Sludge digestion – Standard rate and High rate digester design- Biogas recovery - Sludge Conditioning and Dewatering – Sludge drying beds- ultimate residue disposal – recent advances (8)

**DISPOSAL OF SEWAGE**: Disposal of sewage on land and water — conditions favoring — standards and criteria for dilution - self purification of streams and stages — oxygen sag curve — simple problem - Disposal on land — criteria methods of broad irrigation—subsurface irrigation—sewage sickness of soil (5)

Total L: 45

### TEXT BOOKS:

1. Punmia B.C, "Environmental Engineering Vol. II", Lakshmi Publications (P) Ltd., New Delhi, 2014.
2. Garg, S.K, "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 2013.

### REFERENCES:

1. Birdi G S and Birdie J S, "Water Supply and Sanitary Engineering", 5<sup>th</sup> Edition, Dhanpat Rai and Sons, New Delhi, 2013.
2. Metcalf & Eddy MC, "Wastewater Engineering — Treatment & Reuse", Tata McGraw Hill Publications, New Delhi, 2003.
3. Karia G.L &, Christian RA, "Wastewater Treatment: Concepts and Design Approach", 2<sup>nd</sup> Edition, Prentice Hall India Learning Private Limited, 2013.
4. CPHEEO, "Manual on Sewerage and Sewage Treatment Systems", Central Public Health And Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, New Delhi, 2013.

## 19C604 GEOTECHNICAL ENGINEERING II

3 0 0 3

**STABILITY OF SLOPES & EARTH PRESSURE ON RETAINING WALLS** : Stability analysis of infinite and finite slopes - Factor of safety against sliding - stability analysis by Swedish circle method - method of slices — Taylor's stability chart - Lateral earth pressure - Rankine's earth pressure theory - Coloumb's theory - Basic assumptions and limitations - Applications to retaining walls using Rankine's theory - Culmann's graphical method — Stability of retaining walls. (10)

**SOIL EXPLORATION** : Planning - Boring, sampling and sounding - Hand augers and power drills - wash boring - sampling - Spacing and depth of exploratory borings - preservation of samples - subsurface soundings - Standard Penetration Test - Static Cone Penetration Test - Dynamic Cone Penetration Test - preparation of soil investigation report (6)

**BEARING CAPACITY OF SHALLOW FOUNDATIONS** : Various definitions - types of failures - Types of foundations - Historical development of bearing capacity theories - Contributions by Terzaghi and Meyerhoff - estimation of bearing capacity as per IS 6403 recommendations - factors affecting bearing capacity - bearing capacity of granular soil based on SPT value - contact pressure distribution diagram on the base of the footings - eccentric loading - determination of ultimate bearing capacity of an eccentrically loaded footing - examples. (10)

**SETTLEMENT OF SHALLOW FOUNDATIONS** : Immediate and consolidation settlements - Differential settlement - Allowable bearing pressure based on tolerable settlement - Plate load test - Provisions of IS 1888 - Interpretation of test results - limitations - Allowable pressure on the basis of settlement criterion for footings on sand on the basis of N value. Allowable bearing pressure for raft foundation on sand - Provisions of IS 8009 (Part 1). (7)

**PILE FOUNDATIONS** : Types of piles based on their function, composition and method of installation - Determination of vertical load capacity of a single pile - provisions of IS 2911 (Part 1) - static formulae-dynamic pile driving formulae-Engineering News formula - Modified Hiley's equation - pile load test - method of carrying out the test - Determination of allowable load from pile load test data - provisions of IS 2911 (Part 4) - load carrying capacity of piles based on static cone penetration test and standard penetration test results - Group of piles- Number and spacing - pile group efficiency in sands and clays - pile group efficiency equations - settlement of pile groups in clay and sand - examples - Negative skin friction - piles subjected to uplift. Foundations on expansive soil: Identification of expansive soil - Field conditions favoring swelling - Consequences of swelling -concept of under reamed pile - Provisions of IS 2911 (Part 3) (12)

**Total L: 45**

**TEXT BOOKS:**

1. Gopal Ranjan and A S R Rao , "Basic and Applied Soil Mechanics", 3<sup>rd</sup> Edition, New Age International.(P) Ltd, New Delhi, 2016.
2. Varghese P.C , "Foundation Engineering", Prentice-Hall of India Private Limited, New Delhi, 2012.

**REFERENCES:**

1. Murthy, V N S , "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2014.
2. Wayne C Teng , "Foundation Design", Prentice Hall of India Private Ltd, New Delhi, 1980.
3. Bureau of Indian Standards , "Relevant IS codes on soil investigation, bearing capacity, settlement and pile foundations", BIS, New Delhi, .
4. Joseph E Bowles , "Foundation Analysis and Design", 6<sup>th</sup> Edition, The McGraw-Hill Companies Inc, New Delhi, 2011.

## **19C605 ESTIMATION AND COSTING**

**2 1 0 3**

**METHODS AND TYPES OF ESTIMATES** : Types of estimates — Units of measurements — Methods of estimates — Different methods of approximate estimate- Advantages. (5 + 3)

**ESTIMATE OF BUILDINGS** : Quantity estimate for load bearing and framed structural quantity estimate for various types of arches - brick work and RCC works only - Calculation of quantities of earth work excavation, brickwork, PCC, RCC, Plastering and painting/varnishing –residential building. Estimation - steel roof truss (10 + 5)

**ESTIMATE OF OTHER STRUCTURES** : Estimating for septic tank -soak pit –sanitary and water supply installations — Plumbing and water supply pipe line — sewer line—estimate of earthwork for cutting and filling for road and other structures -estimate of bituminous and cement concrete roads (5 + 1)

**ANALYSIS OF RATES AND SPECIFICATIONS** : Data — Schedule of rates — Analysis of rates — Specifications — Steel requirement and Bar bending schedule (3 + 3)

**REPORT PREPARATION AND VALUATION** : Principles for report preparation — report on estimate of residential building — Roads — Water supply and sanitary installations. Specifications — sources — General and Detailed specifications - Valuation-Different methods of valuation of a building — capitalized value — Depreciation — Escalation—Value of building—Calculation of Standard rent-Mortgage-lease. (7 + 3)

**Total L: 30 +T: 15 = 45**

**TEXT BOOKS:**

1. Chakraborti M , "Estimation, Costing, Specification and Valuation in Civil Engineering (including Computer estimation)", 2015.
2. Dutta , "Estimating and Costing in Civil Engineering",, UBS Publishers & Distributors Pvt. Ltd, 2015.

**REFERENCES:**

1. G.S.Birdie , "Text book of Estimation and Costing (Civil Engineering)", Dhanpat Rai & Sons,.
2. Rangwala.S.C , "Estimating, Costing and Valuation", 17<sup>th</sup> Edition, Charotar, Gujarat, 2015.

## **19C606 HYDROLOGY AND WATER RESOURCES ENGINEERING**

**3 0 0 3**

**PRECIPITATION** : Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation. (9)

**ABSTRACTION FROM PRECIPITATION** : Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall (9)

**HYDROGRAPHS** : Factors affecting Hydrograph - Base flow separation - Unit hydrograph - Derivation of unit hydrograph - S curve hydrograph - Unit hydrograph of different deviations - Synthetic unit hydrograph (10)

**FLOODS AND FLOOD ROUTING** : Flood frequency studies - Recurrence interval - Gumbel's method - flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control (9)

**GROUND WATER HYDROLOGY** : Types of aquifers - Darcy's law — Dupuit's assumptions - Confined Aquifer — Unconfined aquifer - Recuperation test - Transmissibility — Specific capacity - Pumping test - Steady flow analysis only (8)

**Total L: 45**

**TEXT BOOKS:**

1. Jayarami Reddi P , "Text book of Hydrology", Second, Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Raghunath H M , "Hydrology - Principles. Analysis, Design", Second, New Age International (P) Ltd., New Delhi, 2006.

**REFERENCES:**

1. Chow V T and Maidment , "Hydrology for Engineers", Second, McGraw Hill Inc., Ltd., 2000.
2. Patra K C , "Hydrology and Water Resources Engineering", First, Narosa Publishing House, New Delhi, 2006.
3. Subramanya K , "Engineering Hydrology", Third, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2006.

## **19C610 ENVIRONMENTAL ENGINEERING LABORATORY**

**0 0 4 2**

1. Determination of Turbidity
2. Determination of pH Value
3. Determination of Taste and Odour
4. Determination of Solids
5. Determination of settleable solids
6. Determination of Optimum Coagulant Dosage
7. Determination of Electrical Conductivity
8. Determination of Hardness

9. Determination of Alkalinity
10. Determination of Chlorides
11. Determination of Sulphate
12. Determination of Residual Chlorine in water
13. Determination of Available Chlorine in Bleaching Powder
14. Determination of Nitrate
15. Determination of Iron and Manganese
16. Determination of Fluoride
17. Determination of Dissolved Oxygen
18. Determination of Bio - Chemical Oxygen Demand
19. Determination of Chemical Oxygen Demand
20. Bacteriological Analysis of water (Demonstration)
21. Estimation of Noise Level (Demonstration)
22. Estimation of Air Pollution (Demonstration)

**Total P: 60**

**REFERENCES:**

1. Department of Civil Engineering , "Environmental Engineering Laboratory Manual", PSG College of Technology, Coimbatore, 2019.

**19C611 BUILDING PLANNING AND DRAFTING LABORATORY**

**0 0 2 1**

**BUILDING DRAWING: TERMS, ELEMENTS OF PLANNING BUILDING DRAWING, METHODS OF MAKING LINE DRAWING AND DETAILED DRAWING:** (2)

**PREPARATION OF APPROVAL DRAWING FOR LOCAL BODY :**

1. Site plan floor plan, elevation
2. Section drawing of small residential buildings-concepts (6)

**DETAILED WORKING DRAWING FOR RESIDENTIAL BUILDING :**

1. Site plan, foundation plan
2. Floor plans, elevation
3. Sectional elevation (10)

**3D DRAWING FOR RESIDENTIAL BUILDING :**

1. 3D drawing of residential building (8)

**PERSPECTIVE DRAWING :**

1. Principles of perspective drawing.
2. Perspective view of building. (4)

**Total P: 30**

**TEXT BOOKS:**

1. Sikka V B , "A Course in Civil Engineering Drawing", 4<sup>th</sup> Edition, S K Kataria and sons, 2009.
2. Balagopal, T S Prabhu, K Vincent Paul, C Vijayaj , "Building drawing and detailing", Spades publishers, Calicut, 1987.

**REFERENCES:**

1. M G Shah, C M Kale, S Y Patki , "Building Drawing: With an Integrated Approach to Built Environment", 4<sup>th</sup> Edition, McGraw Hill, New Delhi, 2002.
2. Hepler D E, Wallach P I , "Architecture, Drafting and Design", McGraw Hill, New York, 1965. BIS, New Delhi, 1995.

## 19C620 INNOVATION PRACTICES

0 0 4 2

### INNOVATION PRACTICES:

1. Preparing a project — brief proposal including : Problem Identification Methodology specifying the process/specifications/ parameters List of alternate methodology if available Justification for the methodology adopted Time line of activities
2. Carrying out experimental/ theoretical work as per the specified time line of activities
3. A presentation including all the above along with final results and conclusions. Consolidated report preparation.

Total P: 60

## 19Q613 QUANTITATIVE AND REASONING SKILLS

0 0 2 1

### QUANTITATIVE AND REASONING SKILLS:

1. Number System, Time and Work
2. Percentages , Simple and Compound Interests
3. Time, Speed and Distance
4. Permutation, Combination and Probability
5. Ratio and Proportion
6. Profit, Loss and Partnership
7. Logarithms, Progressions, Geometry and Quadratic Equations
8. Coding and Decoding
9. Series, Analogy and Odd Man Out
10. Visual Reasoning
11. Data Arrangements
12. Blood Relations
13. Clocks, Calendars and Direction Sense
14. Cubes, Logical Connectives and Syllogisms
15. Venn Diagrams, Interpretations and solving

Total P: 30

### REFERENCES:

1. Aggarwal R S , "Quantitative Aptitude for Competitive Examinations", 3<sup>rd</sup> Edition, S Chand Publishing, New Delhi, 2017.
2. ETHNUS , "Aptimithra", 1<sup>st</sup> Edition, McGraw-Hill Education Pvt Ltd, 2013.
3. FACE , "Aptipedia Aptitude Encyclopedia", 1<sup>st</sup> Edition, Wiley Publications, Delhi, 2016.

## SEMESTER - 7

### 19C710 DESIGN AND DETAILING OF STRUCTURES

0 0 4 2

#### REINFORCED CONCRETE AND BRICK MASONRY :

1. Design and detailing of one way continuous slab , Tee beam and L beam , dog legged stairs and stair case with stringer beams.
2. Design of masonry walls and piers - types of bonds

(30)

#### STEEL ROOF TRUSS:

1. Design of metal roof sheets - design of roof and cladding purlins - loads and load combinations - double plane trusses - design of strut and tie members - bracing design - design of connections - base connection-detailing
2. Weld symbols

(30)

Total P: 60

**TEXT BOOKS:**

1. Krishna Raju. N , "Structural Design and Drawing (Reinforced Concrete and Steel)", III, University Press, Hyderabad, 2006.
2. Krishna Raju N , "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2003.

**REFERENCES:**

1. IS 1905:1987 , "Code of Practice for Structural Use of Unreinforced Masonry", Bureau of Indian Standards, New Delhi, 1987.
2. SP 34:1987 , "Handbook on Concrete Reinforcement and Detailing", Bureau of Indian Standards, New Delhi, 1987.
3. IS 456:2000 , "Indian Standard Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2000.
4. IS 800:2007 , "Indian Standard Code of Practice for General Construction in Steel", Bureau of Indian Standards, New Delhi, 2007.

**19C711 COMPUTER ANALYSIS AND DESIGN LABORATORY****0 0 4 2****ANALYSIS USING SPREADSHEET :**

1. Basic principles, behavior and design of reinforced concrete slabs, beams, columns, footings, grids, frames as per IS codes using computer programs and softwares.
2. Basic principles, behavior and design of steel trusses, beams, columns and frames as per IS codes using computer programs and software

**(12)****ANALYSIS AND BEHAVIOURAL STUDY OF RC AND STEEL STRUCTURES :**

1. Structural analysis of beams and frames -modeling — boundary conditions — loads – loading conditions - load combinations
2. Calculation of deflections, stress resultants - shear force diagrams and bending moment diagrams for beams and frames, axial force diagrams

**(48)****Total P: 60****REFERENCES:**

1. Department of Civil Engineering, "Computer Laboratory manual", PSG College of Technology, Coimbatore, 2019.

**19C720 PROJECT WORK I****0 0 4 2**

- Identification of thrust areas
- Developing a mathematical model for solving the above problem
- Finalization of system requirements and specification
- Proposing different solutions for the problem based on literature survey
- Future trends in providing alternate solutions
- Consolidated report preparation of the above

**Total P: 60****SEMESTER - 8****19C820 PROJECT WORK II****0 0 8 4**

The project work involves the following:

- Preparing a project – brief proposal including Problem Identification

- Methodology specifying the process/specifications/ parameters - List of alternate methodology if available Justification for the methodology adopted - Time line of activities
- Carrying out experimental/ theoretical work as per the specified time line of activities
- A presentation including all the above along with final results and conclusions.
- Consolidated report preparation.

**Total P: 120**

## **PROFESSIONAL ELECTIVES**

### **19C001 ADVANCED REINFORCED CONCRETE DESIGN**

**3 0 0 3**

**SPECIAL STRUCTURAL MEMBERS AND DUCTILE DETAILING** : Flat slabs direct design method and detailing - ribbed hollow block slabs - waffle slabs - deep beams and walls - design of corbels - concepts of ductility, factors influencing ductility, design principles and Codal provisions. (11)

**YIELD LINE THEORY** : Yield line theory for slabs of square - rectangular and circular shapes with different boundary conditions subjected to UDL by virtual work method - concept of segmental equilibrium method - corner lever effects - lower bound solution-introduction to Hiller Borg's strip method. (9)

**RETAINING STRUCTURES AND SHEAR WALLS** : Design and detailing of cantilever and counterfort retaining walls - design and detailing of tanks resting on the ground, underground and elevated water tanks with staging as per IS 3370. - classification and loads in shear walls - moment of resistance of rectangular walls - ductile design of shear walls (9)

**BUNKERS AND SILOS** : Design of a square bunker as per IS 4995 - design of a circular silo - Jenssen's theory - principle of Airy's theory (no derivation or problems). (9)

**CHIMNEYS** : Design of RC chimneys as per IS 4998 for combined effect of self load - wind load and temperature (7)

**Total L: 45**

#### **TEXT BOOKS:**

1. Varghese P.C , " Advanced Reinforced Concrete Design", Prentice Hall of India , New Delhi, 2005.
2. Krishna Raju N , "Advanced Reinforced Concrete Design", CBS Publishers, New Delhi, 2010

#### **REFERENCES:**

1. Punmia B.C Ashok Kumar Jain and Arun Kumar Jain , " Comprehensive RCC Designs,", Lakshmi Publications (P) Ltd, New Delhi, 2005.
2. Winter, Nilson A H , "Design of Concrete Structures", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2005.
3. Unnikrishnan Pillai S and Devdas Menon , "Reinforced Concrete Design", 3<sup>rd</sup> Edition, Tata McGraw Hill Publishing Co, Ltd, NewDelhi,2010.
4. N Subramanian, "Design of Reinforced Concrete Structures", 1<sup>st</sup> Edition, Oxford University Press, 2014.

### **19C002 ADVANCED STEEL DESIGN**

**3 0 0 3**

**DESIGN OF COMPOSITE BEAMS** : Design for composite construction - encased beam - types of shear connectors - degree of shear connection - partial and complete shear connection. (6)

**DESIGN OF COMPOSITE COLUMNS AND BEAM-COLUMNS** : Design for composite construction of columns and beam columns - design of in-filled and encased columns - square, circular and rectangular cross sections. (9)

**DESIGN OF COMPOSITE SLABS** : Design of slabs using decking profile - resistance to longitudinal shear - resistance to vertical shear - bending resistance of composite slab - profile sheeting - parallel and perpendicular to beams. (6)

**LIGHT GAUGE SECTIONS** : Light gauge sections - types of sections, material - local buckling of thin elements - stiffened, unstiffened and multiple stiffened elements - compression members - laterally supported and unsupported flexural members - connections - design of cold formed steel purlins. (9)

**INDUSTRIAL BUILDINGS** : Design of simple and rigid frames — gable frames — knee bents - long span roofs - pre-engineered buildings. (15)

**Total L: 45**

**TEXT BOOKS:**

1. Ramchandra and Vivendra Gehlot , "Design of Steel Structures", 10<sup>th</sup> Edition, Scientific Publishers (India), Jodhpur, 2007.
2. Subramanian N , "Design of Steel Structures-Limit States Method", 2<sup>nd</sup> Edition, Oxford University Press, NewDelhi, 2017.

**REFERENCES:**

1. Johnson R.P , "Composite Structures of Steel and Concrete", Wiley India Pvt. Ltd, India, 2013.
2. Jayagopal L S, Tensing D , "Design of Steel Structures", Vikas Publishing House Pvt Ltd, NewDelhi, 2016.
3. Charles G Salmon & John E Johnson , "Steel Structures — Design & Behaviour", 3<sup>rd</sup> Edition, Harper Collins Publishers, 1990.
4. Robert Englekirk , "Steel Structures, Controlling Behaviour through Design", John Wiley & Sons Inc, 2003.

**19C003 BASICS OF STRUCTURAL DYNAMICS AND EARTHQUAKE RESISTANT DESIGN**

**3 0 0 3**

**BASIC CONCEPTS IN STRUCTURAL DYNAMICS** : Single and Two degrees of freedom system - linear systems - equation of motion - components of vibration system - natural frequency - viscous damping - response to undamped & damped free and forced vibration - response to support motion - principle of accelerometers and displacement meters. (15)

**STRUCTURES MODELED AS SHEAR BUILDINGS** : Free vibration of a shear building - forced vibration of a shear building - reduction of dynamic matrices. (6)

**ELEMENTS OF EARTHQUAKE ENGINEERING** : Elements of Engineering Seismology - Indian Seismicity - faults - seismic waves - earthquake intensity and magnitude - earthquake ground motion - behaviour of structures in the past earthquakes - basic terminology. (5)

**EARTHQUAKE RESPONSE** : Linear systems: Earthquake ground motion - response spectrum - response history analysis - IS codal provisions for the determination of lateral loads - modal analysis. (9)

**DESIGN CONCEPTS** : Seismic Design Concepts - design spectrum - Earthquake Resistant Design of simple framed structures - IS 1893 codal provisions - ductile detailing of Reinforced Concrete frames as per IS 13920. (10)

**Total L: 45**

**TEXT BOOKS:**

1. Anil K Chopra , "Dynamics of Structures - Theory and Applications to Earthquake Engineering", Prentice Hall of India (P) Ltd, NewDelhi, 2004.
2. Pankaj Agarwal & Manish Shrikhande , "Earthquake Resistant Design and Structures", Prentice Hall of India, NewDelhi, 2006.

**REFERENCES:**

1. Clough R W and Penzein , "Dynamics of Structures", McGraw Hill Book Co Ltd, NewDelhi, 1993.
2. Paz Mario, William Leigh , "Structural Dynamics - Theory and Computation", 5<sup>th</sup> Edition, Springer, NewDelhi, 2004.
3. Craig, R.R, and Andrew J.K , "Structural Dynamics - An Introduction to computer Methods", JohnWiley & Sons, 2006.
4. Manickaselvam, V.K , "Elementary Structural Dynamics", Dhanpat Rai & Sons, 2001.



## 19C004 BRIDGE ENGINEERING

3 0 0 3

**INVESTIGATIONS AND PLANNING :** Need for investigation- selection of bridge site - preliminary data collection and preliminary drawings - determination of design discharge - linear water way - economic span - afflux-scour depth - choice of bridge type - importance of investigation. Standard specifications for road bridges and railway bridges - general design considerations. (9)

**SUBSTRUCTURES AND BEARINGS :** Piers and abutments - function - aesthetics - materials; wing walls construction aspects - Bearings - types - design of rocker and roller bearings. (9)

**REINFORCED CONCRETE BRIDGES :** Design of T beam and Slab Bridge - design principles of RC balanced cantilever bridge and - Super structure - types - choice of materials - design principles, considerations and criteria of pipe culverts, slab culvert, box culvert, and causeways. (9)

**DESIGN PRINCIPLES OF RC AND STEEL BRIDGE :** Design of T beam and Slab Bridge - design principles of RC balanced cantilever bridge and articulation - Design concepts of rigid frame bridges ,Suspension bridges - cable stayed bridges and their components. (9)

### **ELEMENTS OF PRESTRESSED CONCRETE BRIDGE DESIGN, CONSTRUCTION AND MAINTENANCE :**

Size, prestressing force, eccentricity, design of cables, end blocks - Bridge superstructure construction - supports and centering for RC bridges - erection of precast RC girders and steel girder bridges - maintenance of bridges, strengthening of bridges. (9)

**Total L: 45**

### **TEXT BOOKS:**

1. D.Johnson victor , "Essentials of Bridge Engineering", 6<sup>th</sup> Edition, Oxford and IBH Publishing Co., New Delhi, 2007.
2. Krishna Raju N , "Design of bridges", 5<sup>th</sup> Edition, Oxford and IBH Publishing Co., New Delhi, 2017.

### **REFERENCES:**

1. Bakhi B , Jaeger L.G , " Bridge deck analysis simplified", McGraw Hill book company, 1987.
2. Jagadeesh T.R , Jayaram M.A , "Design of bridge structures", PHI Learning Private limited, 2010.
3. Ponnuswamy S , "Bridge Engineering", third, Tata McGraw Hill Publishing Co., New Delhi, 2017.

## 19C005 DESIGN OF ENERGY EFFICIENT BUILDINGS

3 0 0 3

**THE CLIMATE :** Factors that determine climate - components of climate - characteristics of climatic types: Design for various climatic zones: Passive and active energy control. Body heat balance - the sensation of heat comfort zone - exercise on the establishment of effective temperature and comfort zone. (6)

**SOLAR CONTROL AND HEAT FLOW THROUGH MATERIALS :** Movement of the sun-charts - calculation of Altitude and azimuth - solar charts - shadow angle - solar shading - design of shading devices. (5)

**THERMAL COMFORT AND NATURAL VENTILATION :** Thermal comfort factors - Principles of heat gain and losses through building and calculation of heat gain and losses - passive means of thermal comfort design of buildings. Calculation of U values. Concept of green buildings. - Natural Ventilation-The wind-elements of air and their effect on human beings: Air movement through buildings-thermally induced air flow pattern in buildings: ventilation requirements for health – Mechanisms and estimation of natural ventilation. (12)

**DAYLIGHTING AND ARTIFICIAL LIGHTING :** Day Lighting-Principles of day lighting analysis and design - design of fenestration in buildings various types - quality of day lighting - illumination design - luminaries and their characteristics - code requirements - Artificial Lighting-Types and luminaries design interiors determination the illumination level -Lumen method - artificial lighting to supplement day lighting. Modern theory of light and colour. (11)

**ACOUSTICS, SOUND INSULATION AND NOISE CONTROL** : Introduction - scope of study. Absorption co-efficient and their measurement Absorption materials used and their choice-Resonance - reverberation and echo-actual and optimum RT - RT for various uses and calculations. Acoustics of buildings: Characteristics of audible sound - behavior of sound and its effect - acoustical defects - acoustical defects - acoustics of buildings - sound absorbents and acoustical materials. Sound insulation of buildings: Introduction to effects and types of noise - transmission of noise - sound insulation vs sound absorption - transmission loss - maximum acceptable noise levels - means of noise control and sound insulation. - Design of acoustical buildings. - Noise Control- Characteristics and effect of noise - source and control of noise in buildings of various types -planning and design against outdoor and indoor noise. Noise contour. (11)

**Total L: 45**

**TEXT BOOKS:**

1. Koenigsberger O.H, Ingersoll T.G , "Manual of Tropical housing and Building -Climatic design", University Press, Hyderabad, Reprint 2011.
2. Dr. B.C.Punmia, Er.Ashok k jain. , "Building Construction Engineering", 11<sup>th</sup> Edition, Lakshmi Publications (P)Ltd, New Delhi, 2016.

**REFERENCES:**

1. Ishwar Ch, Bhargava P K , "The Climate Hand Book", Tata Mc Graw Hill, New Delhi, 1999.
2. Majumdar M, "Energy Efficient Buildings in India", TERI, 2000.
3. SP:41 (1987) , "Hand book on Functional Requirements of Buildings (other than Industrial Buildings)".

## **19C006 DISASTER MANAGEMENT AND MITIGATION**

**3 0 0 3**

**NATURAL DISASTERS** : Cyclones - Floods - Drought and Desertification - Earthquake - Tsunami - Volcanoes - Landslides and Avalanche (9)

**MAN MADE DISASTERS** : Chemical industrial hazards - Major power breakdowns - Traffic accidents - Fire, Forest Fire, Oil fire - War - Atom bombs - Nuclear disaster - Accident in Mines (9)

**GEOSPATIAL TECHNOLOGY** : Remote sensing - GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation - Disaster mapping (9)

**RISK ASSESSMENT AND MITIGATION** : Hazards, Risks and Vulnerabilities - Disasters in India - Assessment of Disaster Vulnerability of a location and vulnerable groups - Preparedness and Mitigation measures for various Disasters - Mitigation through capacity building - Preparation of Disaster Management Plans (9)

**DISASTER MANAGEMENT** : Legislative responsibilities of disaster management - Disaster management act 2005 – Post disaster recovery and rehabilitation, Relief & Logistics Management - Disaster related infrastructure development - Post Disaster, Emergency Support Functions and their coordination mechanism (9)

**Total L: 45**

**TEXT BOOKS:**

1. Ramana Murthy , "Disaster Management", Dominant, New Delhi, 2004.
2. Rajdeep Dasgupta , "Disaster Management and Rehabilitation", Mittal Publishers, New Delhi, 2007.

**REFERENCES:**

1. Murthy D B N , "Disaster Management: Text and Case Studies", Deep and Deep Publications (P) Ltd., 2007.
2. Sundar I , Sezhiyan T , "Disaster Management", Sarup and Sons, 2007.
3. Khanna B K , "All You Wanted To Know About Disasters", New India Publishing Agency, 2005.
4. A status report , "Disaster Management in India", National Disaster Management Institute, Ministry of Home Affairs, Govt. of India, 2004.

## 19C007 REPAIR AND REHABILITATION OF STRUCTURES

3 0 0 3

**BUILDING MAINTENANCE, CRACKS & DAMPNES** : maintenance classification — structural appraisal — building maintenance - Building cracks - Principal sources of crack formation — diagnosis of cracks - Sources of dampness — moisture movement from ground — reasons for ineffective DPC - leakage in slab — ferrocement overlay technique (13)

**REPAIR MATERIAL** : Epoxy— polymer & latex— acrylic polymers — polyester resins - application of repair chemicals - concrete repair chemicals - examples of concrete chemicals for repair (6)

**CONCRETE STRUCTURE** : Types and causes of deterioration — diagnosis of deterioration - Corrosion of steel in reinforced concrete - Treatment against carbonation induced and chloride induced corrosion-cracks in RCC structural elements and their prevention (8)

**MASONRY STRUCTURE** : Causes and treatment of cracks — cracks in load bearing walls - masonry partition walls - Remedial measures — cracks in plastering and rendering — surface cracks — corner cracks — cracks in building due to swelling of soil (9)

**STRENGTHENING OF EXISTING STRUCTURES** : General principles — relieving loads — strengthening super structure — plating — conversion to composite construction - post stressing — jacketing — bonded overlays — section enlargement and addition of reinforcement - strengthening of substructure (9)

**Total L: 45**

### TEXT BOOKS:

1. P C Varghese , "Maintenance, Repair and Rehabilitation and Minor works of Buildings", PHI Pvt Ltd, 2014.
2. B L Gupta & Amit Gupta , "Maintenance and Repair of Civil Structures", Standard publishers distributors, 2007.

### REFERENCES:

1. Macdonald S , "Concrete — Building Pathology", Blackwell Science limited, 2003.
2. Strecker P P , "Corrosion Damaged Concrete — Assessment and Repair", Butterworths , 1987.
3. Denison Campbell, Allen , Harold Roper , "Concrete structures, Materials, Maintenance and Repair", Longman scientific and technical , 1991.
4. Raina VK , "Concrete for Construction — Facts and Practice", Tata Mac Graw Hill , 1999.

## 19C008 INDUSTRIAL STRUCTURES

3 0 0 3

**PLANNING AND FUNCTIONAL REQUIREMENTS**: Planning and layout of low-rise buildings for different functions - Lighting and Ventilation - Fire Safety - Protection against noise and vibration - Guidelines from factories act. (9)

**DESIGN OF FRAMES** : Design of simple and rigid frames as per IS 800 - Gable frames - Knee bents - Pre Engineered Buildings. (9)

**DESIGN OF CHIMNEYS AND TOWERS** : Self-supporting Chimneys - IS 6533 provisions - Guyed Chimneys – Design of towers - Design of Masts. (9)

**INDUSTRIAL ROOFING STRUCTURES** : Planning and Design of industrial sheds and Trusses - Bracing of roofs and Vertical bracing of buildings - Design of purlins - Design of gantry girder and gantry columns. (9)

**BUNKERS AND SILOS** : Pressure on side walls of bunkers and silos - Janssen's and Airy's theories - Design of rectangular and square bunkers Bunkers with sloping bottom and design of staging - Design of Silos including their supporting structures and foundation. (9)

**Total L: 45**

### TEXT BOOKS:

1. Subramanian.N , " Design of Steel Structures", 2<sup>nd</sup> Edition, Oxford University Press, NewDelhi, 2017.

2. Dunham C W , "Planning Industrial Structures", McGraw Hill Book Company, Inc., 1980.

**REFERENCES:**

1. Jayagopal L S & Tensing D , "Design of Steel Structures", Vikas Publishing House Pvt Ltd., 2016.
2. Charles G Salmon & John E Johnson, "Steel Structures — Design & Behaviour", Harper Collins Publishers, 1990.
3. Robert Englekirk , "Steel Structures, Controlling Behaviour through Design", John Wiley & Sons, 2003.
4. Ram Chandra , "Design of Steel Structures - 2", 13<sup>th</sup> Edition, Scientific Publishers (India), Jodhpur, 2008

## 19C009 PRESTRESSED CONCRETE STRUCTURES

3 0 0 3

**PRINCIPLES, ANALYSIS AND LOSSES** : Principles - types of prestressing - materials definition of Type I, Type II and Type III structures - requirements - behaviour of PSC elements - force transmitted by pretensioned and post tensioned systems- analysis - service loads - ultimate strength. - - losses due to deformation and slip of anchorage units - elastic shortening, frictional losses - shrinkage and creep of concrete, relaxation of steel - as per IS 1343 : 2012. (13)

**DESIGN FOR FLEXURE** : Philosophy - limit states - concepts - collapse and serviceability - - service load – basic requirements - stress range approach - Lin's approach - Magnel's approach - cable layouts (7)

**DESIGN FOR SHEAR AND TORSION** : Shear and principal stresses - limit state shearing resistance of cracked and uncracked sections - - design of shear reinforcement by limit state approach. - Behaviour under torsion - modes of failure - design for combined torsion - shear and bending as per IS 1343 : 2012. (7)

**DEFLECTION AND TRANSFER OF PRESTRESS** : Transmission of prestressing force by bond in pretensioned members - Transmission length - Factors affecting transmission length - check for transmission length - transverse tensile stresses - end zone reinforcement. - Anchorage zone stresses in post-tensioned members - Magnel's method - Calculation of bearing stress and bursting tensile forces - code provisions - Reinforcement in anchorage zone. - Deflection - short and long term deflection of uncracked and cracked members as per IS 1343 : 2012. (7)

**TANKS AND PIPES** : Circular prestressing in liquid retaining tanks - analysis for stresses - design of tank wall. PSC pipes - types - design of non cylinder pipes. (5)

**STATICALLY INDETERMINATE STRUCTURES** : Methods of achieving continuity - assumptions in elastic analysis - pressure line - linear transformation - concordant cables - Guyon's theorem - analysis and design of continuous beams. (6)

Total L: 45

**TEXT BOOKS:**

1. Rajagopalan N , "Prestressed Concrete", 2<sup>nd</sup> Edition, Narosa Publishing House, New delhi, 2005.
2. Krishna raju , "Prestressed Concrete", 5<sup>th</sup> Edition, Tata McGrawhill publishers, Newdelhi, 2012.

**REFERENCES:**

1. Praveen Nagarajan , " Prestressed Concrete Design", Pearson, 2013.
2. Sinha N C, Roy S K , " fundamentals of Prestressed concrete", S Chand & Co, 1985.

## 19C010 FINITE ELEMENT ANALYSIS

3 0 0 3

**DIRECT STIFFNESS FOR PIN JOINTED FRAMES** : Structural Mechanics Concept , Matrix Displacement Method of Analysis - Stiffness matrix, Principle of superposition - Basic Theory of Finite Element Method, Application of Finite Element Method - Advantages and Disadvantages - Concept of direct stiffness, Element Stiffness - Element Assembly to Global Stiffness Matrix, Boundary Condition - Plane truss - displacement of joints, forces in members - Space truss, numerical examples - (9)

**DIRECT STIFFNESS METHOD FOR BEAMS AND PLANE RIGID FRAMES** : Direct Stiffness for Beams and Frames - stiffness matrix for beam element, principle of superposition - Continuous beams, assembly of element stiffness matrices - application of boundary conditions, consistent load vector - evaluation of displacements at nodes, element end forces -

shear force and bending moment diagrams - plane rigid frame element, global and local coordinate systems - transformation matrix, element assemble, stiffness matrix - analysis of plane rigid frames, axial force, shear force and bending moment diagrams (9)

**CONCEPTS OF ELASTICITY AND TWO DIMENSIONAL STRESS ANALYSIS :** Introduction to Elasticity theory, Basic concepts - Constitutive law, plane stress, plane strain problems - Equilibrium equations, compatibility equations, transformation - Saint Venant's Principle - Idealisation, Triangular Element - Constant Strain Triangle, strain displacement matrix - Element Stiffness, Assembly of Element Stiffness - Application to simple problems - Introduction to Isoparametric elements, basic concepts only. (9)

**METHOD OF WEIGHTED RESIDUAL AND VARIATIONAL FORMULATION :** trial function, residue, weight concepts - methods of weighted residual and applications - collocation method and over determined collocation method - subdomain method, galerkin's method - method of least squares - calculus of variations, euler lagrange equation functional, rayleigh ritz method concept - application to deflection of beams - application to buckling load of columns (9)

**SOLUTION TECHNIQUES FOR STATIC AND DYNAMIC ANALYSIS :** Linear system of equations, storage schemes, band form of storage - gaussian elimination method - cholesky decomposition method - application to static analysis, evaluation of displacements - eigen value problems, stress analysis, stability problems - mass matrix, lumped mass, consistent mass - jacobi method for eigen value problems - evaluation of maximum eigen value by forward iteration - evaluation of minimum eigen value by inverse iteration (9)

**Total L: 45**

**TEXT BOOKS:**

1. Rajasekaran S and Sankarasubramanian G , "Computational Structural Mechanics", 1<sup>st</sup> Edition, Prentice Hall of India Pvt. Ltd., new delhi, 2001.
2. Rajasekaran S , "Finite Element Analysis in Engineering Design", 1<sup>st</sup> Edition, S Chand & Co, New Delhi, 2003.

**REFERENCES:**

1. C S Krishnamoorthy , "finite element analysis - Theory and programming", 1<sup>st</sup> Edition, Tata McGraw Hill Publishing Co, New Delhi, 1994.
2. Cook R D, Malkus D S, et al , "Concepts and Applications of Finite Element analysis", 4<sup>th</sup> Edition, John Wiley & Sons, New York, 2003.
3. Chandrapatla and Belegundu , "Introduction to Finite Elements in Engineering", 1<sup>st</sup> Edition, Prentice Hall of India, New Delhi, 2002.

## **19C011 PREFABRICATED STRUCTURES**

**3 0 0 3**

**DESIGN PRINCIPLES :** Need for industrialized methods in building construction - Historical perspective of precast construction in India - Specific requirements for planning and layout of prefabrication plant - Modular Coordination - Standardization - Mechanization - Disuniting of Prefabricates - Types of prefabrication - Prefabrication systems - Material Properties - Moulds - Manufacture of prefabricated components - Transport and Erection of structural components - Finishing and Fitting up operations - Dimensional deviation and Tolerance - Principles of structural design of prefabricated components - IS Code Specifications (10)

**FLOORS AND ROOFS :** Types of floor slabs - Flooring arrangements - Behaviour - Analysis and design of voided slab floor elements and composite plank floor - Design of Horizontal Floor diaphragms - Types of Roof Slab and its behaviour - Design considerations of shell roofs for industrial sheds - Cylindrical, Folded plate and hyper- prefabricated shells - Erection and jointing techniques (9)

**WALLS :** Types of wall panels - Blocks and large panels, Sandwich wall Panels, Curtain, Partition and load bearing walls - behaviour - Load transfer path - Stability of wall panels - Location of shear wall in buildings - Design of shear walls - Leak prevention, joint sealants and Expansion joints (8)

**PRECAST RC FRAME COMPONENTS :** Precast Frame Analysis - Analysis and Design of Beams, Columns and corbel - Structural integrity - Design for Progressive collapse (9)

**JOINTS AND CONNECTIONS :** Basic force transfer mechanisms - Design Philosophy - Types of joints - Compression,

Tension, shear, Flexural and Torsional joints - Structural Connections - Connection Materials - Methods of Connection analysis - Connection between various structural precast elements (9)

**Total L: 45**

**REFERENCES:**

1. Handbook on Precast Concrete buildings , 1<sup>st</sup> Edition, Indian Concrete Institute, Chennai, 2016.
2. Kim S.Elliot , "Precast concrete structures", 2<sup>nd</sup> Edition, CRC Press (Taylor and Francis Group), London, 2016.
3. Kim S.Elliot, Collin K.Jolly , "Multi storey Precast concrete framed structures", 2<sup>nd</sup> Edition, Wiley Blackwell, Hoboken, United States, 2013.
4. fib 43 , "Structural connections for Precast concrete buildings", 1<sup>st</sup> Edition, International federation for structural concrete (fib), Switzerland, 200.

## **19C015 GROUNDWATER ENGINEERING**

**3 0 0 3**

**FUNDAMENTALS OF GROUNDWATER:** Introduction - Occurrence of groundwater - movement of groundwater - classification of aquifers - distribution of water - groundwater column - Permeability - Darcy's Law - laboratory permeability test - types of aquifers - hydrogeological cycle - water level fluctuations. (9)

**HYDRAULICS OF FLOW :** Storage coefficient - specific yield - heterogeneity and anisotropy -transmissivity - governing equations of groundwater flow - steady state flow - Dupuit Forchheimer assumptions - Velocity potential - Flow nets. (9)

**ESTIMATION OF PARAMETERS :** Transmissivity and Storativity - Pumping test - unsteady state flow – Thiess method - Jacob method - Image well theory - effect of partial penetrations of wells. (9)

**GROUNDWATER DEVELOPMENT, SURFACE INVESTIGATION OF GROUNDWATER :** Infiltration gallery - collector wells - conjunctive use - artificial recharge -safe yield -yield test - Selection of pumps - Geophysical methods of groundwater, electrical resistivity method, seismic refraction method, gravity and magnetic method, remote sensing techniques. (9)

**WATER QUALITY :** Groundwater chemistry - Origin, movement and quality - water quality standards - saltwater intrusion - Environmental concern. Control of groundwater contamination - Groundwater Modeling. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Raghunath H M, "Ground Water", Third edition, New Age International Publisher, 2007.
2. David K. Todd &, Larry W. Mays, "Groundwater Hydrology", Wiley student edition, 2014.

**REFERENCES:**

1. Franklin W. Schwartz &, Hubao Zhang , "Fundamentals of Groundwater", student edition, Wiley,2003.
2. Ramakrishnan S , "Ground Water", Second edition, Scitech publications India Pvt LTD, 2011.
3. Jacob Bear , "Hydraulics of Groundwater", McGraw Hill Education, 2013.

## **19C016 IRRIGATION ENGINEERING**

**3 0 0 3**

**NEED FOR IRRIGATION :** Advantages and disadvantages - Types of irrigation - soil formation - functions and properties of soils - types of soil moisture - suitability of soil for crops - suitability of water for irrigation – standards for irrigation water (7)

**REQUIREMENTS OF WATER :** Duty and delta of a crop - factors affecting duty - crop seasons - Techniques of water distribution - optimum utilization - irrigation efficiency - consumptive use and its estimation (7)

**IRRIGATION CANAL AND SEDIMENT TRANSPORT :** Alluvial and non alluvial canals - Alignment of canals - Distribution

system - command area - intensity of irrigation - Channel losses - Estimation of required canal capacity - Design of stable channels - Kennedy's and Lacey's theories - cross section of irrigation channels in cutting and embankment - problems and maintenance of irrigation channels (11)

**LINING OF CANALS AND WATER LOGGING** : Need and justification for lining of canals - Design of lined canals - cross-section - types of lining — drainage - Causes of water logging - methods of reclaiming a water logged area (10)

**RIVER TRAINING AND TANK IRRIGATION** : Behaviour of rivers - need for controlling their behaviors - River training works - Tanks in isolation and series - capacity of water spread - estimation of inflow - principal elements of an irrigation tank (10)

**Total L: 45**

**TEXT BOOKS:**

1. Santhosh Kumar Garg , "Irrigation and Hydraulic Structures", 16<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2014.
2. Punmia BC, Pande B B Lal, Ashok Kumar Jain, Arun Kumar Jain , "Irrigation and Water Power Engineering", 12<sup>th</sup> Edition, Laxmi Publications (P) Ltd., New Delhi, 2014.

**REFERENCES:**

1. Sahasra Budhe S R , "Irrigation and Hydraulic Structures", Katson Publishing House, Ludhiana, 2012.
2. Asawa G L , "Irrigation and Water Resources Engineering", 1<sup>st</sup> Edition, New Age International Publishers, New Delhi, 2014.
3. Sharma R K, Sharma T K , "Irrigation Engineering", 3<sup>rd</sup> Edition, S Chand and Company Ltd., New Delhi, 2012.

## **19C021 ENVIRONMENTAL IMPACT ASSESSMENT**

**3 0 0 3**

**ELEMENTS OF ENVIRONMENT IMPACT ASSESSMENT (EIA)** : Elements of Environment Impact Assessment (EIA) Objectives - Environmental Impact statement (EIS) - EIA capability and limitations - Legal provisions on EIA - Impact of development projects under Civil Engineering on environment (6)

**METHODOLOGIES AND PREDICTION AND ASSESSMENT** : Methods of EIA - Checklists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives - case studies - Impact prediction, assessment and monitoring on Socio-economic, - Soil, Water and Air quality, Noise, Transport, Ecology - Mathematical models - public participation - Rapid EIA (14)

**ENVIRONMENTAL MANAGEMENT PLAN** : Plan for mitigation of adverse impact on environment - options for mitigation of impact on water - air and land - flora and fauna; addressing the issues related to the project affected people- Remote sensing and GIS in EIA - ISO 14000. (8)

**EIA IN INDIA** : Procedure for environmental clearance - Flow chart - Environmental guidance for Thermal power plants - Mining projects - River valley development projects - Legislation and Institutional support - International co-operation - Guidance for industrial licensing. (8)

**CASE STUDIES** : EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - water supply and drainage projects. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Larry Canter , "Environmental Impact assessment", McGraw Hill Inc, 2014.
2. Anji Reddy , "Environmental Impact Assessment: Theory and Practice", BS Publications, 2014.

**REFERENCES:**

1. Peter Morris , Riki Therivel , "Methods of Environmental Impact assessment", Span Press, 2001.
2. John G Rau , David C Hooten (Ed) , " Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
3. Judith Petts , " Handbook of Environmental impact Assessment Vol. I & II", Blackwell Science, 1999.

## 19C022 INDUSTRIAL WASTE MANAGEMENT

3 0 0 3

**INDUSTRIAL POLLUTION** : Types of industries and industrial pollution - characteristics of industrial wastes - Population equivalent - Bioassay studies - effects of industrial effluents on streams - sewer - land - sewage treatment plants and human health - Environmental legislation related to prevention and control of industrial effluents and hazardous wastes - Common effluent treatment plants. (9)

**WASTE MANAGEMENT** : Waste management Approach - Environmental Auditing - ISO 14000 - Basics and Approaches - Volume and strength reduction - Material and process modifications - Waste minimization – Recycle – reuse and byproduct recovery - Applications. (9)

**TREATMENT TECHNOLOGIES** : Equalization - Neutralization - removal of suspended and dissolved organic solids – Chemical oxidation - Adsorption - Removal of dissolved inorganic solids - Combined treatment of industrial and municipal wastes - Common Effluent Treatment methods - Residue management - Dewatering - Disposal. (10)

**POLLUTION CONTROL FROM AGRO BASED INDUSTRIES** : Sources - characteristics - waste treatment flow sheets for selected industries such as Textiles - Tanneries - dairy - Sugar - Paper - Distilleries (9)

**POLLUTION CONTROL FROM OTHER MAJOR INDUSTRIES** : Sources - characteristics - waste treatment flow sheets for Pharmaceuticals - Electroplating industries - Steel plants - Refineries - Fertilizer - Thermal power plants - Wastewater reclamation concepts. (8)

**Total L: 45**

### TEXT BOOKS:

1. Rao MN, Dutta AK, "Wastewater Treatment", Fourth, Oxford — IBH Publication, New Delhi, 2007.
2. Eckenfelder W W Jr., "Industrial Water Pollution Control", McGraw Hill Book Company, 2000.

### REFERENCES:

1. Nemerow N L, "Industrial waste treatment", Butterworth-Heinemann, 2007.
2. Shen T T, "Industrial Pollution Prevention", Springer, 1999.
3. Freeman H M, "Industrial Pollution Prevention Hand Book", McGraw Hill Inc., 1995.
4. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw Hill, 2000.

## 19C023 SOLID WASTE MANAGEMENT

3 0 0 3

**SOURCES AND TYPES** : Sources and types of solid wastes - Quantity - factors affecting generation of solid wastes; characteristics - methods of sampling and characterization; Effects of improper disposal of solid wastes - public health effects. Principle of solid waste management - social & economic aspects; Public awareness; Role of NGOs; Legislation. (10)

**ON-SITE STORAGE & PROCESSING** : On-site storage methods - materials used for containers - on-site segregation of solid wastes - public health & economic aspects of storage - options under Indian conditions - Critical Evaluation of Options. (8)

**COLLECTION AND TRANSFER** : Methods of collection - types of vehicles - Manpower requirement – collection routes - transfer stations - selection of location - operation & maintenance; options under Indian conditions. (8)

**TREATMENT AND DISPOSAL** : Processing techniques and Equipment; Resource recovery from solid wastes - composting - incineration - pyrolysis - options under Indian conditions - Dumping of solid waste; sanitary landfills site selection design and operation of sanitary landfills - Leachate collection and treatment. (11)

**HAZARDOUS WASTE MANAGEMENT** : Hazardous - radioactive and biomedical wastes - Physico Chemical treatment - solidification - incineration - secured landfills. (8)

**Total L: 45**



**TEXT BOOKS:**

1. George Tchobanoglous, Hilary Theisen, Samuel Vigil , "Integrated Solid Waste Management", McGraw Hill Publishers, 2004.
2. Bilitewski, Bernd, Härdtle, Georg, Marek, Klaus , "Waste Management", Springer, 2004.

**REFERENCES:**

1. CPHEEO , "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Landreth R.E. , Rebers P. A, "Municipal Solid Wastes — Problems and Solutions", Lewis Publishers, 1997.
3. Bhide A.D. and Sundaresan, B.B. , "Solid Waste Management in Developing Countries", INSDOC, 1993.
4. Bhide A.D. and Sundaresan, B.B. , "Solid Waste Collection, Processing and Disposal", First, Authors, Nagpur, 2001.

**19C026 GEOSYNTHETICS IN CIVIL ENGINEERING****3 0 0 3**

**OVERVIEW OF GEOSYNTHETICS AND DESIGN PRINCIPLES :** Overview of Geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geopipes and geocomposites - their current applications for various functions, Mechanism of reinforced soil - Factors influencing behaviour and performance, Soil-reinforcement interaction. (9)

**USE OF GEOSYNTHETICS IN ROADS :** Applications, Role of subgrade conditions - Design - The Giroud and Noiray approach - Geotextile serviceability, Application in pavement overlays. (8)

**DESIGN OF REINFORCED SOIL RETAINING WALLS :** Components of reinforced soil walls - Principles of design — Internal and external stability - Design examples. (9)

**IMPROVEMENT OF BEARING CAPACITY :** Modes of failure in reinforced earth, Determination of force induced in reinforcement - Guidelines on the use of geogrids, Bearing capacity improvement in soft soils. (8)

**EMBANKMENTS IN SOFT SOILS, USE OF GEOSYNTHETICS FOR FILTRATION AND DRAINAGE:** Analysis, Influence of reinforcement extensibility, deformation in foundation - Overall stability with respect to bearing. - Applications, Geotextile filter requirements, boundary conditions - drain and filter properties, design criteria. (11)

**Total L: 45****TEXT BOOKS:**

1. Sivakumar Babu G L , "Introduction to Soil Reinforcement and Geosynthetics", Universities Press, Hyderabad, 2009.
2. Robert M Koerner , "Designing with Geosynthetics", 5<sup>th</sup> Edition, Prentice Hall, New Jersey, 2005.

**REFERENCES:**

1. Mandal J N , "Geosynthetics World", 1<sup>st</sup> Edition, New Age International (P) Ltd., New Delhi, 2007.
2. Braja M Das , "Shallow Foundations: Bearing Capacity and Settlement", CRC Press, New York, 1999.
3. Jones C J F P , "Earth Reinforcement and Soil Structures", Thomas Telford Publishing, 1996.

**19C027 GROUND IMPROVEMENT TECHNIQUES****3 0 0 3**

**INTRODUCTION :** Role of ground improvement in foundation engineering - Methods of ground improvement - Geotechnical problems in alluvial and black cotton soils - Selection of suitable ground improvement techniques based on soil condition. (9)

**DRAINAGE AND DEWATERING :** Drainage techniques-well points - vacuum and electroosmotic methods - Seepage analysis for two dimensional flow - Fully and partially penetrating slots in homogeneous deposits (Simple cases only). (9)

**INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS :** Insitu densification of cohesionless and consolidation of cohesive soils-Dynamic compaction and consolidation - vibrofloatation - Sand compaction pile - Preloading with sand drains and fabric drains - Stone columns - Lime piles-Installation techniques only - Relative merits of various methods and their limitations. (9)

**EARTH REINFORCEMENT** : Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - Use of Geotextiles for filtration - drainage and separation in road and other works. (9)

**GROUT TECHNIQUES** : Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilisation with cement - lime and chemicals - Stabilisation of expansive soils. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Purushothama Raj , "Ground Improvement Techniques", Tata McGraw Hill Publishing Company, New Delhi, 2016.
2. Robert M Koerner , "Design with Geosynthetics", Prentice Hall, New Jersey, 2005.
3. Satyendra Mittal , "An Introduction to Ground Improvement Engineering", Scientific International Private Limited, New Delhi, 2013.

**REFERENCES:**

1. Joseph E Bowles , "Foundation Analysis and Design", McGraw Hill Companies. Inc., New York, 2011.
2. Braja M Das , "Principles of Foundation Engineering", Thomson Publishing company, Brooks/Cole Division, 2004.
3. Shashi K Gulhati , Manoj Datta , "Geotechnical Engineering", Tata McGraw Hill Education (P) Ltd., New Delhi, 2010.
4. Kenneth D Weaver , Donald A Bruce , "Dam Foundation Grouting", ASCE Press, Virginia, 2007.

## **19C028 PAVEMENT ENGINEERING**

**3 0 0 3**

**PRINCIPLES OF PAVEMENT DESIGN** : Types of pavement-flexible and rigid- Components of pavement and their functions - Provisions of IRC Guidelines for each component - Comparison between highway and airport pavements - Factors influencing pavement stability: Vehicle and traffic factors-ESWL and Wheel Load Factor- Moisture and climate - soil-CBR - Hveem stabilometer method - Plate Bearing method for finding modulus of subgrade reaction and North Dakota Cone method- and stress distribution factor-Boussinesq and Burmister theories. (9)

**DESIGN OF FLEXIBLE PAVEMENT** : Empirical method based on arbitrary strength-CBR method-Provisions of IRC 37- Plate Bearing method (US Navy method for airfields) - Theoretical and semi-theoretical methods-Kansas and Texas triaxial methods - IRC guidelines for design of flexible rural roads. Federal Aviation Administration (FAA) method (Recommended by International Civil Aviation Organization) (9)

**STRESSES IN RIGID PAVEMENT** : Stresses in rigid pavement due to wheel load-Westergaard - Older - Bradbury and Kelly theories- Stresses due to change in temperature-warping stress-theory by Bradbury- Stress due to subgrade restraint - Critical combination of stresses. (5)

**DESIGN OF RIGID PAVEMENT** : Modulus of Rupture of concrete - Design of airport pavement- Federal Aviation Administration (FAA) method (Recommended by International Civil Aviation Organization) - Design of rigid highway pavement- IRC 58 method - IRC guidelines for design of rigid rural roads - Types of joints - Types of rigid pavement based on reinforcement - Design of reinforcement in longitudinal and transverse direction - tie bars and dowel bars. (10)

**PAVEMENT DISTRESS, EVALUATION AND REHABILITATION INCLUDING STABILIZATION** : Distresses in flexible and rigid pavements - condition surveys - Types of roughness - present serviceability index - skid resistance - structural evaluation - Benkelman deflection method - Design of overlays both for highway and airport pavements - flexible overlay over flexible pavement - rigid overlay over rigid pavement - flexible overlay over rigid pavements - Methods suggested by IRC - FAA and Asphalt Institute - Stabilisation with special reference to highway pavements Chemical and mechanical stabilisation - Use of Geosynthetics (geotextiles and geogrids) in roads. (12)

**Total L: 45**

**TEXT BOOKS:**

1. Kadiyali, Lal , "Principles and Practice of Highway Engineering", Khanna Tech Publications, New Delhi, 2010.
2. Yoder E J, Witczak MW , "Principles of Pavement Design", John Wiley and Sons Inc, New York, 2011.

**REFERENCES:**

1. IRC: 37-2001 , "Guidelines for the Design of Flexible pavements", Indian Road Congress, New Delhi, 2001.
2. IRC: 58-2002 , "Guidelines for the Design of Rigid Pavements for Highways", Indian Road Congress, New Delhi, 2002.

3. IRC:SP:20-2002 , "Rural Roads Manual", Indian Road Congress, New Delhi, 2002.
4. IRC: 81-1997 , "Guidelines for Strengthening of Flexible Road Pavements Using Benkelman Beam Deflection Technique", Indian Road Congress, New Delhi, 1997.

## 19C031 AIRPORT DOCKS AND HARBOUR ENGINEERING

3 0 0 3

**INTRODUCTION:** Air transportation in India - Component parts of aero plane - Aircraft characteristics comprehensive view of Metro Airports in India - Key developers in India. (3)

**AIRPORT PLANNING AND DESIGN :** Objects and Types of surveys - Airport zoning - Clearance over highways and railways - Airport layouts - Apron –Hangars - Terminal buildings - Airports buildings - Passenger flow Passenger facilities. (8)

**RUNWAY AND TAXI WAY DESIGN AND AIR TRAFFIC CONTROL :** Basic runway length - Balanced field concept- Comparison of runway patterns - Orientation of Runway- Taxiway design - Separation distances — Design speed - Corrections to basic runway length- - Drainage - Visual aids — Runway and taxiway markings - Runway and Taxiwaylightings - Wind direction indicators - Air traffic control network - Helipads — Service equipments. (14)

**DOCKS AND HARBOURS :** Definition of terms — Classification of Harbours - Ports, Docks — Tides — Waves and waves dynamics - Littoral drift –Hydrographic survey and Topographic Survey -Sounding line, satellite ports - Classification of harbors — Site selection and investigation - Harbour layout - Dry and wet docks, Locks - Navigational aids- Light houses — Mooring accessories - Dredging-classification and type - Current Scenario. (10)

**COASTAL STRUCTURES :** Piers - Slipways - Breakwaters - Wharves - Jetties - Dolphins, Quays ,Spring fenders - Coastal shipping - Inland water transport - Container transportation - Pipe ways - Rope ways - Major port profiles- Visakhapatnam, Chennai, Mumbai, Cochin - inter port comparison. (10)

**Total L: 45**

### TEXT BOOKS:

1. Rangwala , "Airport Engineering", 13<sup>th</sup> Edition, Charotar Publishing House Pvt. Ltd, Anand Gujarat, 2012.
2. Hasmukh P. Oza and Gutam H. Oza. , "Docks and Harbour Engineering", 7<sup>th</sup> Edition, Charotar Publishing House Pvt. Ltd, Anand,Gujarat, 2013.

### REFERENCES:

1. S.K. Khanna, M.G. Arora, S.S.Jain , "Airport Planning & Design", 6<sup>th</sup> Edition, Nem Chand & Brothers, Roorkee, 2012.
2. Bindra.S.P , "Docks and Harbour Engineering", Dhanpat Rai&Sons, New Delhi, 2012.
3. Hamukh P.Oza, Gautam H.Oza , "Dock and harbour Engineering", 7<sup>th</sup> Edition, Charotar, Gujarat, 2013.

## 19C032 HOUSING PLANNING AND MANAGEMENT

3 0 0 3

**INTRODUCTION TO HOUSING AND HOUSING ISSUES – INDIA CONTEXT :** Definition of Basic Terms — House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies — levels - Development Control Regulations, Institutions for Housing at National, State and Local levels. Housing and its importance in neighborhood and city planning. Housing demand and supply — National Housing Policy — Housing agencies and their role in housing development — impact of traditional life style — Rural Housing, Public, private sector housing (10)

**SOCIO- ECONOMIC ASPECTS AND LOW-INCOME HOUSING AND HOUSING :** Economics of housing; housing demand and supply; quantifying and estimating housing need; housing process and housing adjustment; formal and informal sector provision of housing; legislation for housing development, slum housing and re-development, sites and services, low-cost housing- case studies in India and developing countries. Housing affordability- Cost effective materials and technologies for housing. (10)

**HOUSING STANDARDS** : URP — guidelines, CCA, EIA, stipulated by NIUA, model inclusive zoning, DCR, CRZ rules for Indian cities, housing density, street classification and standards; housing standards for EWS, LIG, MIG and HIG and facilities programming for housing and housing development. **FINANCE AND PROJECT APPRAISAL**: Appraisal of Housing Projects — Housing Finance, Cost Recovery — Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems) (9)

**SITE PLANNING AND HOUSING DESIGN** : Site Planning and green building practices: Selection of site for housing, consideration of physical characteristics of site, location factors, orientation, climate, topography — Landscaping- Housing design — Traditional housing, row housing, cluster housing —apartments and high-rise housing relating to Indian situations — case studies in India —integration all types of services, parking, concepts relating to housing and housing developments and incorporation of green building and sustainable practices in Indian and International context —prefabrication in housing (8)

**COMMUNITY ARCHITECTURE AND DISASTER RESISTANT HOUSING** : Community architecture movement and housing developments, community participation and housing management — Environmental aspects and natural calamities; planning and design for cyclone, landslide, earthquake and disaster mitigation (8)

**Total L: 45**

**TEXT BOOKS:**

1. Chandra Sekar.K, Karthikeyan.N , "Housing Planning & Management Revised", 2<sup>nd</sup> Edition, CGS Publishers & Distributors, Tamil Nadu, 2016.
2. Meera Mehta and Dinesh Mehta , "Metropolitan Housing Markets", Sage Publications Pvt. Ltd, 2010.

**REFERENCES:**

1. Richard Kintermann and Robert , "Small Site Planning for Cluster Housing", Van Nostrand Reinhold company, Jondon/New York, 1977.
2. HUDCO Publications , "Housing for Low Income, Sector Model", Energy Research Institute,2016.

## **19C033 TRAFFIC ENGINEERING, SAFETY AND MANAGEMENT**

**3 0 0 3**

**INTRODUCTION** : Significance and scope - Characteristics of Vehicles and Road Users - Skid Resistance and Braking Efficiency (Problems) - Components of Traffic Engineering- Road - Traffic and Land Use Characteristics. (9)

**TRAFFIC SURVEYS AND ANALYSIS** : Surveys and Analysis - Volume - Capacity - Speed and Delays - Origin and Destination - Parking - Pedestrian Studies - Accident Studies and Safety Level of Services- Problems. (9)

**TRAFFIC CONTROL** : Traffic signs - Road markings - Design of Traffic signals and Signal co-ordination (Problems) – Traffic control aids and Street furniture - Street Lighting - Computer applications in Signal design. (8)

**GEOMETRIC DESIGN OF INTERSECTIONS** : Conflicts at Intersections - Classification of Intersections at Grade - Chanellised and Unchanellised Intersection - Grade Separators (Concepts only)- Principles of Intersection Design - Elements of Intersection Design - Chanellisation and Rotary design (Problems) - Grade Separators (10)

**TRAFFIC MANAGEMENT** : Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM) - Traffic Forecasting techniques - Restrictions on turning movements - One-way Streets - Traffic Segregation - Traffic Calming - Tidal flow operations - Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS). (9)

**Total L: 45**

**TEXT BOOKS:**

1. Khanna.K, Justo C.E.G , "Highway Engineering", Khanna Publishers, 2001.
2. Kadiyali.L.R , "Traffic Engineering and Transport Planning", Khanna Book Publishing Co ltd,2003.

**REFERENCES:**

1. Papacostas. C.S, Prevendouros.P.D , "Transportation Engineering and Planning", Prentice Hall, New Delhi, 2002.
2. O'Flaherty.C.A. , "Transportation Planning and Traffic Engineering", 1<sup>st</sup> Edition, Butterworth-Elsevier, Oxford, 2006

Reprint.

3. Wolfgang.s, Homburger, Louis E Keefer, William.R.Mcrath , "Transportation and Traffic Engineering Hand Book", 2<sup>nd</sup> Edition, Prentice Hall, New Jersey, 1982.

## 19C036 CARTOGRAPHY

3 0 0 3

**INTRODUCTION** : Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry-Map Scales and Contents. (9)

**EARTH** : Earth-Map Relations - Basic Geodesy -- Map Projections - Reference and Coordinate system - Transformation - Basic Transformation - Affine Transformation. (9)

**SOURCES OF DATA**: Ground Survey and Positioning -Remote Sensing data collection - Census and sampling - data - Models for digital cartographic information - Map digitizing. (9)

**PERCEPTION AND DESIGN** : Cartographic design - Color theory and models - Color and pattern creation and specification, Color and pattern - Typography and lettering the map - Map compilation. (9)

**CARTOGRAPHY ABSTRACTION** : Selection and Generalisation Principles ,Symbolisation, Topographic and thematic maps - Map production and Reproduction - Map series. (9)

**Total L: 45**

### TEXT BOOKS:

1. Arthur, H. Robinson , "Elements of Cartography", Seventh, John Wiley and Sons, 2004.
2. John Campbell , "Introductory Cartography", Third, WMC Brown Publishers, 2004.

### REFERENCES:

1. Anson R.W. and Ormeling F.J, "Anson R.W. and Ormeling F.J", Third, Elsevier Applied Science Publishers,, 2004.
2. Robert G Cromley , "Digital Cartography", Prentice Hall, 1992.

## 19C037 GEOGRAPHIC INFORMATION SYSTEMS

3 0 0 3

**GIS TECHNIQUE AND DATA INPUT** : Map — Types of Maps — Map projections, Development of GIS — Components of GIS — Hardware, software, organisation — Types of data -Spatial and non-spatial data —Sources of data - Point, Line and Polygon — Vector and Raster data — Database structures — Vector and Raster data structures- Important GIS softwares and their relevance. (9)

**DATA ANALYSIS AND MODELLING** : : Data Retrieval — Query — Simple Analysis — Spatial Analysis — Overlay — Vector Data Analysis — Raster Data Analysis — Modelling using GIS — Digital Elevation Model — Cost and path analysis—ExpertSystems—ArtificialIntelligence—IntegrationwithGIS. (9)

**DATA OUTPUT AND ERROR ANALYSIS** :Data Output — Types — Devices used — Raster and Vector Display Devices - Printers – Plotters – Devices – Sources of Errors –Types of Errors–Elimination–Accuracies-GIS Standards-Open Source GIS, Internet GIS (9)

**GIS APPLICATIONS IN RESOURCE MANAGEMENT** : Fields of Applications — Natural Resources — Agriculture — Soil - Water Resources — Site Selection for civil Engineering Projects, Wasteland Management - Social Resources - Cadastral Records—LIS (9)

**ADVANCED GIS APPLICATION** : AM/FM — Utility Network Management — Integration with Remote Sensing — Knowledge based techniques – Multicriteria Techniques – Introduction to Object Oriented Data base Models (9)

**Total L: 45**

### TEXT BOOKS:

1. Burrough P A , "Principles of GIS for Land Resources Assessment", Oxford Publication, 2000.

2. Elangovan K , "GIS: Fundamentals, Applications and Implementations", First, New India Publishing Agency, New Delhi, 2006.

**REFERENCES:**

1. Kang-Tsung Chang , "Introduction to Geographic Information Systems", TMH, 2002.
2. Chrisman N R , "Exploring Geographic Information Systems", Second, John Wiley & Sons, New York, 2002.
3. Michael N Demers , "Fundamentals of Geographical Information Systems", Second, John Wiley Publications, 2002.
4. Clarke K C , "Getting started with Geographic Information Systems", Third, Prentice Hall, 2001.

**19C038 REMOTE SENSING TECHNIQUES AND APPLICATIONS**

**3 0 0 3**

**PRINCIPLES AND CONCEPTS :** Definition - Historical Background - Components of Remote Sensing- Electromagnetic spectrum - Visible - Infra Rd - NIR - Thermal IR - Microwave - Radiation Principle and Energy equations- - Active and Passive Remote Sensing- - platforms-Aerial and Space Platforms-Baloons-Helicopters - Aircrafts and satellites - Significance of Remote Sensing - Limitations (9)

**ENERGY INTERACTION WITH ATMOSPHERE AND EARTH SURFACE MATERIALS :** Atmospheric Characteristics - Atmospheric interference- Scattering of EMR-Rayleigh - Mie and Non Selective Scattering-Absorption-Atmospheric Windows- Spectral Signature- interaction of EMR with atmosphere - earth surface - soils - water and vegetation. (9)

**REMOTE SENSING SATELLITES AND DATA INTERPRETATION :** Satellites-Types-Based on Orbits and Purpose- Sun Synchronous and Geostationary Satellites- Characteristics of Satellites-Landsat - SPOT - IRS - IKONOS - Quickbird - MODIS - SeaWifs and other currently available Satellites- visual image interpretations and digital image interpretations (9)

**WATER RESOURCES AND LAND USE STUDIES :** Aerial assessment of surface water bodies - Capacity survey of water bodies - mapping of snow-covered areas - flood risk zone mapping - identification of groundwater potential zones - recharge areas - droughts - definition - drought assessment and management.-Definition of landuse - landuse / landcover classification - schemes and levels of classification systems with RS data - landuse mapping - change detection - urban landuse planning - site suitability analysis - transportation planning. (9)

**AGRICULTURE, SOIL, FORESTRY AND EARTH SCIENCE :** Crop inventory mapping - production estimation - command area monitoring - soil mapping - crop stress detection - estimation of soil erosion - forest types and density mapping - forest fire risk zone mapping- Lithology - lithological mapping - structural mapping - Geomorphology - nature and type of landforms - identification - use of remote sensing data for landslides - targeting mineral resources - Engineering geology and Environmental geology. (9)

**Total L: 45**

**TEXT BOOKS:**

1. Floyd F Sabins , "Remote Sensing: Principles and interpretation", W H Freeman and Company., 2000.
2. Jensen J R , "Remote sensing of the environment", First, Pearson Education, New Delhi, 2009.

**REFERENCES:**

1. Chen C H , "Image Processing for Remote Sensing", CRC Press, 2008.
2. George Joseph , "Fundamentals of Remote Sensing", University Press, 2004.

**ONE-CREDIT COURSES**

**19CF01 SAFETY IN CONSTRUCTION**

**1 0 0 1**

**BASIC CONCEPTS :** Problems impeding safety in construction industry causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident construction regulations - contractual clauses Pre contract activities, preconstruction meeting. (3)

**SUBSTRUCTURE ACTIVITIES** : Excavations, trenches, shafts tunneling blasting - pre blast and post blast inspection, confined spaces, working on contaminated sites, work over water (3)

**HEIGHT WORKS** : Safe access and egress safe use of ladders Scaffolding, requirement for safe work platforms, stairways, gangways and ramps - fall prevention and fall protection, safety belts, safety nets, fall arrestors, controlled access zones, working on fragile roofs, work permit systems erection of structural framework, road works, safety in high-rise construction (3)

**CONSTRUCTION EQUIPMENTS** : Selection, operation, inspection and testing of cranes, (mobile cranes, tower cranes), crane inspection checklist builder's hoist, winches, chain pulley blocks use of concrete mixers, concrete vibrators - safety in earth moving equipment, excavators, dozers, loaders, dumpers, graders, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools. (3)

**DEMOLITION** : Safety in demolition work, manual, mechanical, using explosives keys to safe demolition, pre survey inspection, method statement - site supervision, safe clearance zone, fire hazards and preventing methods, implosion (3)

**Total L: 15**

**TEXT BOOKS:**

1. Hudson R, "Construction Hazard and Safety Hand Book", Butter Worth's, 1985.
2. Jonathan D Sime, "Safety in the Built Environment", London, 1988.

**REFERENCES:**

1. Davies VJ, Tomasin K, "Construction Safety Hand Book", Thomas Telford Ltd, London, 1990.
2. Charles D, Reese, James V, "Handbook of OSHA Construction Safety and Health", 2006.
3. Accident Prevention Manual for Industrial Operations, NSC, Chicago, 1988.
4. Fulman J B, "Construction Safety, Security and Loss prevention", John Wiley and Sons, 1984.

## **19CF02 CONCEPTS OF SMART CITY**

**1 0 0 1**

**URBAN LOCAL GOVERNANCE** : Urban Local Governance in India - Administrative setup: Different Departments and their functions - Various Civic Services - Challenges of urban local governance in India - 74th Constitutional amendment (5)

**SMART CITY** : Aims and Objectives of Smart City - Salient features of smart city - Special Purpose Vehicle (SPV) - Selection Process - Area Development - Challenges in the city and solutions - Implementation of strategies and Funding patterns (5)

**CASE STUDY AND FIELD VISIT** : Case study based on visit to Coimbatore Smart City Limited (5)

**Total L: 15**

**REFERENCES:**

1. Sameer Sharma, "Smart Cities - Unbundled", 1<sup>st</sup> Edition, Bloomsbury Publishing India Pvt Ltd, New Delhi, 2018.
2. Mani N, "Smart Cities and Urban Development in India", 1<sup>st</sup> Edition, New Centruy Publications, New Delhi, 2016.

## **ENGLISH**

### **19GF01 INTERPERSONAL AND ORGANIZATIONAL COMMUNICATION**

**1 0 0 1**

**INTRA ORGANIZATIONAL COMMUNICATION** : Communication Networks in an Organization; Intra-organizational communication (2)

**INTER ORGANIZATIONAL COMMUNICATION** : Flow Nomenclature; Workplace diversity and intercultural aspects of communication (2)

**COMMUNICATION FUNCTIONS IN ORGANIZATIONS** : Teamwork and team dynamics; Conflict resolution strategies and styles; Leading and influencing others-facilitation skills (3)

**WRITTEN COMMUNICATION** : Email Writing, Professional Reports, and Memos (4)

**INTERPERSONAL SKILLS** : Nature and Dimensions of Interpersonal Communication; Personality and Communication styles; Active listening and intentional responding; Working with emotional intelligence (4)

**Total L: 15**

**REFERENCES:**

1. Bagchi Subroto , "The Professional", Penguin Publications, UK, 2011.
2. PMBOK guide , "A Guide to the Project Management Body of Knowledge", Project Management Institute Inc, USA, 2013.

**19GF02 HUMAN VALUES THROUGH LITERATURE**

**1 0 0 1**

**PROSE** : Kalam's vision of college education in Wings of fire - Emerson's advocacy of independence of Human will in Self-reliance - Harmony in Education-views of Bertrand Russel (4)

**POETRY** : Maintaining Human relations in Robert Frost's Mending Wall - Quest for identity and freedom in Kamala Das's An Introduction (2)

**DRAMA** : Statesmanship and friendship in Girish Karnad's Tughlaq (3)

**ONE-ACT PLAY** : The theme of love in Chekhov's The Bear (3)

**SHORT STORY** : Empathy in Somerset maugham's Mr. Know-all - Family bond in Anita Desai's Devoted son (3)

**Total L: 15**

**TEXT BOOKS:**

1. Faculty - Department of English , "Course materials", PSG College of Technology, Coimbatore, 2019.

**REFERENCES:**

1. Abrams M .H, Harpham , "A Glossary of Literary Terms", Cengage, Boston, 2015.
2. Scholes R, et.al . , "Elements of Literature", IV, Indian Rpt. OUP, New Delhi, 2013.

**HUMANITIES**

**19OFA1 EXPORT – IMPORT PRACTICES**

**1 0 0 1**

**INTRODUCTION** : Export – Import Business – Preliminaries for starting Export – Import Business Registration. (3)

**EXPORT PROCEDURES** : : Obtaining an Export License – Export Credit Insurance – Procedures and Documentation (4)

**FOREIGN EXCHANGE** : Finance for Exports – Pricing - Understanding Foreign Exchange Rates. (3)

**IMPORT PROCEDURES** : Import Policy – License - Procedure and Documentation. (3)

**EXPORT INCENTIVES** : Incentives - Institutional support (2)

**Total L: 15**

**REFERENCES:**

1. Ramagopal C , "Export Import Procedures - Documentation and Logistics", New Age International, 2014.
2. Cherian and Parab , "Export Marketing", Himalaya Publishing House, New Delhi, 2008.
3. Parul Gupta , "Export Import Management", MC-Graw Hill, 2017.
4. Justin Paul, Rajiv Aserkar , "Export Import Management", Oxford, 2013.

**19OFA2 INSURANCE - CONCEPTS AND PRACTICES**

**1 0 0 1**

**INTRODUCTION TO INSURANCE AND RISK MANAGEMENT** : Origin, History, Nature and Scope of insurance – Meaning, types and significance of risk. (3)

**INSURANCE LAWS AND REGULATIONS** : Insurance Act, IRDA Act, Consumer Protection Act, Ombudsman Scheme. (2)



**INSURANCE UNDERWRITING AND RISK MANAGEMENT** : Meaning of underwriting and underwriter, guidelines and steps in the process of underwriting – characteristics, significance and principles of risk management. (4)

**FINANCIAL ASPECTS OF INSURANCE MANAGEMENT** : Role and functions of financial institutions, determination of premium for various insurance products. (3)

**SETTLEMENT OF INSURANCE CLAIMS** : Documents needed during various claims, Factors affecting insurance claims (3)

**Total L: 15**

**REFERENCES:**

1. Scott Harrington, Gregory Niehaus , "Risk Management and Insurance", McGraw Hill Education, 2017.
2. George E Rejda , "Principles of Risk Management & Insurance", Pearson Education, 2017.
3. John Hull , "Risk Management & Financial Institution", John Wiley and Sons, 2018.
4. Arjun Mittal, D D Chaturvedi , "Insurance and Risk Management", Scholar Tech Press, 2017.

## **190FA3 PUBLIC FINANCE**

**1 0 0 1**

**INTRODUCTION:** Nature and Scope of public finance – Principles of taxation. (2)

**PUBLIC REVENUE AND TAXATION:** Sources of Revenue – Tax and non-tax revenue – Classification of Taxes, GST. (4)

**PUBLIC EXPENDITURE:** Importance – Types – Causes of increase in public expenditure – Effects of public expenditure in India. (3)

**DEFICIT FINANCING AND BUDGET:** Sources of public debt – Debt redemption – Budget – Types – Preparation of Budget in India. (3)

**FEDERAL FINANCE:** Centre-State financial relations – Finance commissions. (3)

**TOTAL: 15**

**REFERENCE BOOKS:**

1. Richard A Musgrave and Peggy B Musgrave, "Public Finance in Theory and Practice" – Tata McGraw Hill Education, New Delhi, 2004.
2. Bhatia H.L, "Public Finance" – Vikas Publishing House, 29th Edition, New Delhi, 2012.
3. David N Hyman, "Public Finance: A contemporary application of theory and policy", Cengage Publication, 11th Edition, Noida, 2014.
4. Santhosh Dalvi and Krishnan Venkatasubramanian, "An introduction to Goods and Service Tax: The biggest tax reform in India", CCH Publisher, New Delhi, 2015.

## **190FA4 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**

**1 0 0 1**

**INVESTMENT ENVIRONMENT** : Financial Markets - Classification - Financial Instruments – Security Trading. (2)

**TYPES OF SECURITIES** : Trading – Orders, Margin Trading – Clearing and Settlement Procedures. (5)

**SECURITY ANALYSIS I** : Industry Analysis –Estimation of Rates of Return. (2)

**SECURITY ANALYSIS II** : Company Analysis — Estimation of Rates of Return. (2)

**PORTFOLIO MANAGEMENT** : Measuring Risk and Returns and Treatment in Portfolio Management. (4)

**Total L: 15**

**REFERENCES:**

1. William F Sharpe, Gordon J. Alexander, Jeffery V Bailey , "Investments", Prentice Hall, 2012.
2. Prasanna Chandra , "Investment Analysis and Portfolio Management", TATA McGraw Hill Publishing, 2011.
3. Ranganathan , "Investment Analysis and Portfolio Management", Pearson, 2004.
4. Bhalla V K , "Investment Management", TATA McGraw Hill Publishing, 2011

## 190FA5SOCIAL ENTREPRENEURSHIP

1 0 0 1

**INTRODUCTION TO SOCIAL ENTREPRENEURSHIP:** Social Entrepreneur - Meaning, qualities and skills. Social Entrepreneurship – Characteristics, process and ecosystem – Case Studies. (3)

**SOURCES OF FUNDING FOR SOCIAL ENTREPRENEURSHIP:** The Social Entrepreneurship Frame work. Start-ups and funding - Internal and External. Schemes for social entrepreneurship. (4)

**STRATEGIES IN SOCIAL ENTREPRENEURSHIP:** Industry and Market Analysis, Business planning, concepts of value creation, new ideas and risk taking. (4)

**PROSPECTS AND PROBLEMS IN SOCIAL ENTREPRENEURSHIP:** Opportunities for Social entrepreneurs, an overview of legal structure, tax structure and other liabilities. (4)

**TOTAL: 15**

### REFERENCE BOOKS:

1. S.S. Khanka, "Creativity and Innovation in Entrepreneurship", Sultan Chand & Sons, 2021.
2. C. Paramasivan, "Social Entrepreneurship", New Century Publications, 2016.
3. Robert A. Philips Margret Bonefiel Ritesh Sharma, "Social entrepreneurship, the next big business opportunity", Global Vision Publishing House, 2011.
4. Drucker, Peter, "Innovation and Entrepreneurship", Harper Business, 2006.

## LANGUAGE ELECTIVES

### 19G001 COMMUNICATION SKILLS FOR ENGINEERS

0 0 4 2

#### COMMUNICATION CONCEPTS:

Process of Communication  
Inter and Intrapersonal Communication  
Inter and Intrapersonal Communication Activities (9)

#### FOCUS ON SOFT SKILLS :

Etiquette — Work Place etiquette — Telephone etiquette  
Body Language  
Persuasive Communication  
Public Speaking  
Critical Reasoning and Conflict Management based on Case Studies  
Group Communication  
Meetings  
Interview Techniques (14)

#### TECHNICAL WRITING:

Technical Writing Principles  
Style and Mechanics  
Technical Definitions – Physical, Functional and Process Descriptions  
Technical Report Writing  
Preparing Instructions and Manuals  
Interpretation of Technical Data (15)

#### BUSINESS CORRESPONDENCE :

Writing Emails  
Preparing Resumes  
Memos  
Technical and Business Proposals (7)

#### TECHNICAL COMMUNICATION :

Seminars  
Process Description and Group Discussions  
Use of Visual Aids (15)

**Total P: 60**

**TEXT BOOKS:**

1. Faculty Incharge "Course Material on "Communication Skills for Engineers"", PSG College of Technology., Coimbatore, 2019

**REFERENCES:**

1. Jeff Butterfield "Soft Skills for Everyone", Cengage Learning., New Delhi, 2013
2. Jean Naterop B and Rod Revell "Telephoning in English", Cambridge University Press., Cambridge, 2011
3. David A Mc Murrey and Joanne Buckley "Handbook for Technical Writing", Cengage Learning., New Delhi, 2011
4. Simon Sweeney "English for Business Communication", Cambridge University Press., New Delhi, 2012

**19G002 GERMAN- LEVEL A1.1****0 0 4 2****GUTEN TAG! :**

1. To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages
2. Vocabulary: related to the topic
3. Grammar: W— Questions, Verbs & Personal pronouns I. (10)

**FREUNDE, KOLLEGEN UND ICH :**

1. To speak about hobbies, jobs, learn numbers from 20; build dialogues and frame simple questions & answers
2. Vocabulary: related to the topic
3. Grammar: Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural (10)

**IN DER STADT :**

1. To know places, buildings, question, know transport systems, understand international words; build dialogues and write short sentences
2. Vocabulary: related to the topic
3. Grammar: Definite & indefinite articles, Negotiation, Imperative with Sien verbs (12)

**GUTEN APPETIT! :**

1. To speak about food, shop, converse; Vocabulary: related to the topic; build dialogues and write short sentences
2. Grammar: Sentence position, Accusative, Accusative with verbs, personal pronouns & prepositions, Past tense of haben & sein verbs (13)

**TAG FÜR TAG/ZEIT MIT FREUNDEN :**

1. To learn time related expressions, speak about family, about birthdays, understand & write invitations, converse in the restaurant; ask excuse, fix appointments on phone
2. Vocabulary: related to the topic
3. Grammar: Time related prepositions, Possessive articles, Modalverbs (15)

**Total P: 60****TEXT BOOKS:**

1. Dengler Stefanie "Netzwerk A1.1", Klett-Langenscheidt Gmbh., München, 2013
2. Sandra Evans, Angela Pude "Menschen A1", Hueber Verlag., Germany, 2012

**REFERENCES:**

1. Stefanie Dengler "Netzwerk A1", Klett-Langenscheidt Gmbh., München, 2013
2. Hermann Funk, Christina Kuhn "Studio d A1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2009
3. Rosa-Maria Dallapiazza "Tangram Aktuell 1 (Deutsch als Fremdsprache)", Max Hueber Verlag., Munchen, 2004
4. Christiane Lemcke und Lutz Rohrmann "'Grammatik Intensivtrainer A 1", Goyal Publishers & Distributors Pvt. Ltd., New Delhi, 2012

**19G003 FRENCH LANGUAGE LEVEL 1****0 0 4 2****PARTS OF SPEECH :**

1. inviter et répondre à une invitation, Pronoms sujets
2. L'article définis, l'article indéfinis
3. Conjugation : présent, adjectifs possessifs
4. interrogation, décrire les personnes
5. La vie de quatre parisiens de professions différentes (12)

**ELEMENTS OF GRAMMAR :**

1. Exprimer l'ordre et l'obligation demander et commander
2. l'adjectif possessifs, l'article partitif, l'article démonstratif, négation ne
3. pas, l'article contracté
4. verbe pronominaux
5. prepositions (12)

**SENTENCE STRUCTURE :**

1. Raconter et reporter-donner son avis
2. Futur simple, pronom complètement d'objet direct, passé composé
3. plusieurs région de France, imparfait, pronom y/en, imparfait (12)

**TENSES AND NUMBERS :**

1. Demander l'autorisation-passé récent, futur proche
2. La vie administrative et régionale, Pluriel des noms, moyens de transport (12)

**DISCOURSE :**

1. le discours rapporté, décrire un lieu, exprimer ses préférences
2. décrire la carrière, discuter d'un système éducation de France
3. parler de la technologie de l'information (12)

**Total P: 60****TEXT BOOKS:**

1. Christine Andant étal "À propos (livre de l'élève", LANGER., NEW DELHI, 2012
2. Myrna Bell Rochester "Easy French Step By Step", MCGrawhill Companies., USA, 2008

**REFERENCES:**

1. Michael D. Oates "Entre Amis: An Interactive Approach", Houghton Mifflin., 2005 , 5th
2. Bette Hirsch, Chantal Thompson "Moments Literaries : An Anthology for intermediate French", ..
3. Simone Renaud, Dominique van Hooff "En bonne forme", ..

**19G004 BASIC JAPANESE****0 0 4 2****JAPANESE PEOPLE AND CULTURE :**

1. Basic greetings and responses
2. Basic script — Method of writing hiragana and katakana — Combination sounds and simple words
3. Selfintroductions: "Hajimemashite" -Demonstratives "Kore", "Sore", "Are" — Demonstrative "Kono", "Sono", "Ano"
4. Possessive noun particle "no" — Japanese apartments: Greeting your neighbor (12)

**PARTICLE "NI (AT)" FOR TIME :**

1. kara (from) ~ made(until) — Particle "to (and)"
2. Time periods: Days of the week, months, time of day —Verbs (Present / future and pasttense)
3. Telephone enquiry: Asking for a phone no. And business hours- Destination particle "e". (12)

**LIKES AND DISLIKES :**

1. Potential verbs (wakarimasu and dekimasu) — "Kara (~ because)"
2. Adverbs — Asking some one out over the phone-Verbs denoting presence
3. Introduction to Adjectives (na and ii type) -Verb groups — I, II and III — Exercises to group verbs- Please do (te kudasai)
4. Present continuous tenses (te imasu) — Shall I? (~ mashou ka) — Describing a natural phenomenon (It is raining) (12)

**DIFFERENT USAGES OF ADJECTIVES :**

1. Comparison — Likes and dislikes — Going to a trip- Need and desire (ga hoshii) — Wanting to . . . (Tabeti desu)- Going for a certain purpose (mi -ni ikimasu)
2. Choosing from a menu-Adjectives ("i" and "na" type) — Adjectives (Positive and negative useage) (12)

**ROLE PLAYS IN JAPANESE :**

1. Framing simple questions & answers
2. Writing Short paragraphs & Dialogues
3. A demonstration on usage of chopsticks and Japanese tea party (12)

**Total P: 60****TEXT BOOKS:**

1. Minna no Nihongo, Honsatsu Roma "ji ban (Main Textbook Romanized Version)", . International publisher — 3A Corporation., Tokyo, 2012

**REFERENCES:**

1. Eri Banno et.al "Genki I: An Integrated Course in Elementary Japanese I -Workbook", .., 1999
2. Tae Kim "A Guide to Japanese Grammar: A Japanese Approach to Learning Japanese Grammar", 2014
3. Minna No Nihongo "Translation & Grammatical Notes In English Elementary", ..

