CIVIL ENGINEERING

3RD SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	CMELPA301	Engineering Mathematics -II	50	100	-	150
B	C302	Fluid Mechanics – I	50	100	-	150
C	C303	Mechanics of Solids	50	100	-	150
D	C304	Construction Engineering and Management	50	100	-	150
E	C305	Surveying -I	50	100	-	150
F	C306	Civil Engineering Drawing - I	50	100	-	150
G	C307	Material Testing Laboratory – 1	50	-	100	150
H	C308	Surveying practical – 1	50	-	100	150
Total			400	600	200	1200

ENGINEERING MATHEMATICS - II

CMELPA 301 **3+1**

Module 1 Vector Differential Calculus

Differentiation of vector functions - scalar and vector fields – gradient, divergence and curl of a vector function – their physical meaning – directional derivative – scalar potential, conservative fields – identities – simple problems.

Module 2 Vector Integral Calculus

Line, surface and volume Integrals – work done by a force along a path – Application of Green's theorem, Stokes theorem and Gauss divergence theorem.

Module 3 Function of Complex Variable

Definition of analytic functions and singular points – derivation of C.R. equations in Cartesian co-ordinates – harmonic and orthogonal properties – construction of analytic function given real or imaginary parts – complex potential – conformal transformation of function like z^n, e^z, $1/z$, $\sin z$, $z+k^2/z$ – bilinear transformation – cross ratio – invariant property – simple problems.

Module 4 Finite Differences

Meaning of Δ , ∇, E, μ , δ - interpolation using Newton's forward and backward formula – central differences – problems using Stirling's formula, Lagrange's formula and Newton's divided difference formula for unequal intervals.

Module 5 Difference Calculus

Numerical differentiation using forward and backward differences – Numerical integration – Newton – Cote's formula – trapezoidal rule – Simpson's 1/3rd and

$3/8^{th}$ rule – simple problems. Difference equations – Solution of difference equations.

References

1. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Ltd.
2. Grawal B.S., Higher Engg. Mathematics, Khanna Publishers.
3. M.K.Venkataraman, Numerical Methods in science & Engg., National Publishing Co.
4. S.Balachandra Rao and G.K.Shantha, Numerical Methods, University press.
5. Michael D.Greenberg, Advanced Engg. Mathematics, Prentice-Hall.
6. M. R. Spiegel, Theory and Problems of Vector analysis, McGraw – Hill.

FLUID MECHANICS - I

C302 **3+2**

Module 1

Properties of fluids: Definition and Units, Mass density, specific weight, surface tension, capillarity, Viscosity – Classification of fluids – Ideal and real fluids, Newtonian and non – Newtonian fluids.

Fluid pressure – Atmospheric, Absolute, gauge and Vaccum Pressure, Measurement of Pressure – Piezometer, manometer, Bourden Gauge.

Total pressure and centre of pressure on a submerged lamina. Pressure on a submerged curved surface – pressure on lock gates, Pressure on gravity dams.

Module 2

Buoyancy – Centre of buoyancy – Metacentre – Stability of floating bodies – Determination of metacentric height – Analytical & experimental methods.

Types of flow – Streamline, Path line and Streak line, Velocity Potential, Stream Function, Circulation and Vorticity, Laplace's Differential equation in rectangular co-ordinates for two dimensional irrotational flow.

Flow Net – Orthogonality of stream lines and equipotential lines.

Stream tube – continuity equation for one dimensional flow.

Module 3

Forces influencing motion – Energy of fluids, Euler's equation, statement and derivation of Bernoulli's equation and assumptions made.

Applications of Bernoulli's equation – Venturi meter, Orifice meter, Pitot tube

Orifices and Mouth Pieces – Coefficients of Contraction, Velocity and Discharge, External and internal mouthpiece.

Notches and weirs – Rectangular, triangular, trapezoidal notches, Cippoletti weir, submerged weir, broad crested weir.

Module 4

Flow through pipes: Laminar and Turbulent flow – Reynold's experiment, loss of head due to friction, Darcy – Weishbach Equation, Other energy losses in pipes.

Hydraulic Gradient and Total Energy Lines: Flow through long pipes – Pipes in series and parallel, Siphon, Transmission of power through pipes –nozzle diameter for maximum power transmission.

Laminar Flow in circular pipes: Hagen poiseuille Equation, Laminar flow through porous media, Stoke's law.

Turbulent flow through pipes: Hydro-dynamically smooth and rough boundary, Velocity distribution for turbulent flow.

Drag and lift for immersed bodies.

Module 5

Dimensional Analysis and Model studies: Units and dimensions of physical quantities, Dimensional Homogeneity of formulae and it's application to common fluid flow problems, Dimensional Analysis-Rayleigh's method, Buckingham's method. Derivations of dimensionless parameters, Froude's, Reynold's, Webber, Mach numbers.

Hydraulic Models: Need, Hydraulic Similitude, geometric, Kinematic, Dynamic Similarity, Scale ratios of various physical quantities for Froude's and Reynold's model laws – problems, Selection of scale of models – Distorted models, Moving Bed models, Scale effects in models, Spillway models and Ship models.

References

1. Streeter V. L., Fluid Mechanics, Mc Graw Hill, International Students Edition.
2. Dr. P. N. Modi & Dr. S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House Delhi.
3. Jagdishlal, Fluid Mechanics & Hydraulics, Metropolitan Book Co., Delhi.
4. R. J. Garde and A. G. Mirajoaker, Engineering Fluid Mechanics, Nem Chand & Bross., RoorKee.

MECHANICS OF SOLIDS

C303 **2+2**

Module 1

Stress-strain: Bars of varying cross section-Composite section-temperature stresses.

Strain energy: Gradually applied and suddenly applied load.

Compound stresses: Two dimensional problems-principal stresses and principal planes-maximum shear stress-planes of maximum shear- Graphical method.

Module 2

Bending moment and shear force: Shear force and Bending moment diagrams for various types of statically determinate beams with various loading combinations- relation between load, shear force and bending moment.

Module 3

Stresses in beams: Theory of simple bending- stresses in symmetrical sections- bending stress distribution- modulus of section- shear stress distribution in beams- stress in various sections- built up sections – composite sections- beams of uniform strength.

Module 4

Stresses due to torsion: Torsion of solid and hollow circular shafts- power transmitted-stresses due to axial thrust-bending and torsion.

Springs: Close coiled and open coiled- carriage springs.

Pressure vessels: Thin and thick cylinders-Lame's equation-stresses in thick cylinders due to internal and external pressures.

Module 5

Columns and struts: Short and long columns-elastic instability-Euler's formula for long columns with different end conditions- slenderness ratio- Rankine's formula- Empirical formula-Buit up members-columns subjected to eccentric loading and initial curvature.

Combined bending and direct stresses: Core of different sections- wind pressure on structures.

Unsymmetrical bending: Product of inertia-principal axes-stresses due to unsymmetrical bending.

Shear centre: Shear centre of sections having two axes of symmetry.

References

1. Timoshenko.S.P, Strength of Materials, Part-1, D.Van Nostrand company, Inc.Newyork.
2. Popov E.P., Engineering Mechanics of solids, Prentice Hall of India, New Deihi.
3. Punmia B.C, Strength of Materials and Mechanics of structures, Vol.1, Lakshmi Publications, New Delhi.
4. Vazirani V.N., Ratwani N. M., Analysis of Structures, Vol.1, Khanna Publishers, New Delhi.
5. Kazimi S.M.A., Solid Mechanics, Tata Mc Graw Hill.
6. William A Nash, Strength of Materials, Mc Graw Hill.
7. Ryder G.H., Strength of Materials, ELBS.
8. Arthur Morley, Strength of Materials, ELBS, Longman's Green& Company.

CONSTRUCTION ENGINEERING AND MANAGEMENT

C 304 **3+1**

Module 1

Admixtures in Concrete – light weight concrete – heavy weight concrete – mass concrete – ready mix concrete – polymer concrete – vacuum concrete – shortcrete – pre-packed concrete – pumped concrete.

Joints – Construction joints – expansion joints – contraction joints – sliding joints – joints in water retaining structures etc.

Scaffolding and Formwork (elementary concepts only).

Module 2

Flooring – different types – Mosaic – marble – granite – roofing – pitched and flat roofs – domes and folded plate roofs – doors, windows and ventilators – types – construction details of paneled&glazed– I. S. specifications.

Damp prevention – Causes – Material used – Damp proofing of floors – walls – roofs.

Finished works – plastering, painting – white washing – distempering – application of Snowcem – Concrete repairs-construction and constructed facilities.

Module 3

Functional planning of buildings – general principles of site plan – principles of functional planning – orientation of buildings – shading principles.

Modern construction materials – Intelligent buildings – building automation.

Module 4

Construction management – Mechanisation in construction – earth moving, handling, pneumatic and hoisting equipment – pile driving equipment – Earth work computation – mass diagram – soil compaction & stabilization – owning and operating works of construction equipment.

Module 5

Departmental organizational structure – staff pattern – powers and functions of officers in planning, organising, directing and controlling construction –PWD code.

PWD system of account – classification of transactions –heads of accounts – cash – precautions in keeping accounts – construction accounts.
Stores – Safe custody of stores – classification – works – administrative sanction, technical sanction – categories of works.

References

1. M. S. Shetty, Concrete technology, S.Chand & Co.
2. S. P.Arora, Building construction, Dhanpat Rai & Sons, New Delhi.
3. Dr.Mahesh Varma, Construction Equipment and its Planning and Application, Metropolitan Book Company.
4. R.L.Peurifoy, W.B.Ledbetter, Construction Planning, Equipment, and methods, Tata Mc Graw Hill.
5. B.L.Gupta, Amit Gupta, Construction Management and Accounts, Standard publishers and Distributors.

SURVEYING - I

C305 **3+1**

Module 1

Introduction – Principles – classifications – Chain surveying: Ranging and chaining. Reciprocal ranging – over-coming obstacles –setting perpendicular and gradients – traversing – plotting – errors in chaining and their corrections.
Compass surveying – Prismatic compass – surveyor's compass – bearings – systems and conversions – local attraction – Magnetic declination – dip – traversing – plotting – adjustment of error by graphical and analytical method (Bowditch's). Plane table surveying – Different methods – Traversing.

Module 2

Levelling: levels and staves – spirit level – sensitiveness – bench marks – temporary and permanent adjustments –booking - methods of reduction of levels – arithmetic checks-differential, fly, check and profile levelling cross sectioning – curvature and refraction – reciprocal levelling – errors in levelling – contouring – characteristics and uses of contours – Locating contours- plotting.

Module 3

Theodolite traversing: Transit theodolite – vernier, micrometer and micro-optic theodolites – description and uses – fundamental lines of a transit theodolite – temporary and permanenet adjustments – horizontal angle – reiteration and repetition methods– booking. Vertical angle measurements. Methods of traversing – conditions of closure – closing error and distribution – Gales traverse table – plotting by co-ordinates – omitted measurements.

Tacheometric surveying: - general principles Stadia method – distance and elevation formulae for staff held vertical – Instruments constants – analytic lens – tangential method – use of subtense bar – electromagnetic distance measurement – principles

Module 4

Areas and volumes Areas – by latitude and departure - meridian distance method – double meridian distance method – co-ordinate method – trapezoidal and Simpson's method – area by planimeter. Volume – trapezoidal and prismoidal rule. Volume from contours. - Capacity of reservoirs – Mass haul curve.

Module 5

Curves: Elements of a simple curve – setting out simple curve by chain and tape methods – Rankine's method – two theodolite method – compound and reverse curve (parallel tangents only) – transition curves – different kinds – functions and requirements – setting out the combined curve by theodolite – elements of vertical curve.

References

1. Dr. B. C. Punmia, Surveying Vol. I & II, Laxmi Publications (P) LTD, New Delhi.
2. T.P. Kanetkar & Kulkarni, Surveying and leveling Vol. I&II A.V.G.Publications, Pune.
3. Dr. K. R. Arora, Surveying Vol. I, Standard Book House New Delhi.
4. C. Venkatramaiah, Text Book of Surveying, Universities Press (India) LTD. Hyderabad.
5. S.K.Roy, Fundamental of Surveying, Prentice Hall of India, New Delhi.
6. S.K. Hussain & M.S. Nagaraj, Surveying, S.Chand & Company Limited.
7. B.N.Basak – Surveying.
8. Alak De, Plane Surveying, S.Chand &Co.

CIVIL ENGINEERING DRAWING - I

C306 **0+3**

PART A

Detailed drawings of paneled doors, glazed doors, glazed windows and ventilators with wooden frames. (2 sheets).

Reinforced concrete staircase (1 sheet).

Roof truss in standard steel sections (1 sheet).
Roof lines (1 sheet).
Roof detailing for M. P. tiles (1 Sheet).

PART B

Working drawings – plan, section and elevation of single storied buildings with RC and tiled roofs (only residential buildings) (8 sheets).
(Preparation of plan from line sketches only)

Marks distribution

Part A	40 marks
Part B	60 marks

References

1. Balagopal & T. S. Prabhu, Building drawing & detailing, Spades Publishers and distributors, Calicut.
2. Shah & Kale, Building Drawing, Tata Mc Graw Hill, New Delhi.
3. B.P.Varma, Civil Engineering drawing and House Planning, Khanna Publishers, Delhi.
4. Gurucharan Singh, Subhash Chander Sharma, Civil Engineering drawing, Standard Publishers distributors, Delhi.

MATERIAL TESTING LABORATORY - I

C 307 **0+3**

1. Tests on springs (open and close coiled)
2. Bending Test on Wooden Beams using U. T. M. '
3. Verification of Clerk. Maxwell's Law of reciprocal deflection and determination of E for steel.
4. Torsion Pendulum (M.S. wires. Aluminum wires and brass wires)
5. Torsion test using U. T. M. on M. S. Rod, torsteel and High Tensile steel.
6. Torsion Test on M. S, Road
7. Shear Test on M.S. Rod.
8. Fatigue Test
9. Impact Test (Izod and Charpy)
10. Hardness Test (Brinell, Vicker's and Rebound)
11. Strut Test.

Note

All tests should be done as per relevant BIS.

SURVEY PRACTICAL - I

C308 **0+3**

1. Running a closed compass traverse – plotting and adjustments.
2. Plane table surveying.
   i. Traversing.
   ii. Three point problem
   iii. Two point problem.

3. Levelling.
   i. Study of leveling instruments
   ii. Reduction of levels by H I method
   iii. Reduction of levels by rise and fall method
   iv. Longitudinal sectioning and cross sectioning.
   v. Contouring.

4. Theodolite Surveying
   i. Study of transit theodolite.
   ii. Measurements of horizontal angles by the method of repetition.
   iii. Measurement of horizontal angles by the method of reiteration.

5. Study of minor instruments.

4TH SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	CMELRPTA401	Engineering Mathematics -III	50	100		150
B	C402	Fluid Mechanics – II	50	100		150
C	C403	Structural Analysis - I	50	100		150
D	C404	Engg. Economics and Construction Management	50	100		150
E	C405	Surveying – II	50	100		150
F	C406	Civil Engineering Drawing –II	50	100		150
G	C407	Hydraulics Laboratory	50		100	150
H	C408	Surveying Practical -II	50		100	150
Total			400	600	200	1200

ENGINEERING MATHEMATICS - III

CMELRPTA401
3+1+0

Module 1

Ordinary Differential Equations: Linear Differential equations with constant coefficents - Finding P.I. by the method of variation of parameters – Cauchys equations - Linear Simultaneous eqns- simple applications in engineering problems.

Module 2

Partial Differential Equations: Formation by eliminating arbitrary constants and arbitrary Functions - solution of Lagrange Linear Equations – Charpits Method – solution of homogeneous linear partial differential equation with constant coefficients – solution of one dimensional wave equation and heat equation using method of separation of variables – Fourier solution of one dimensional wave equation.

Module 3

Fourier Transforms: Statement of Fourier Integral Theorems – Fourier Transforms – Fourier Sine & Cosine transforms - inverse transforms - transforms of derivatives – Convolution Theorem (no proof) – Parsevals Identity - simple problems.

Module 4

Probability and statistics: Binomial law of probability - The binomial distribution, its mean and variance - Poisson distribution as a limiting case of binomial distribution - its mean and variance - fitting of binomial & Poisson distributions - normal distribution - properties of normal curve - standard normal curve - simple problems in binomial, Poisson and normal distributions.

Module 5

Population & Samples: Sampling distribution of mean (σ known) –Sampling distribution of variance, F and Chi square test – Level of significance - Type 1 and Type 2 errors – Test of hypothesis – Test of significance for large samples – Test of significance for single proportion, difference of proportions, single mean and difference of mean (proof of theorems not expected).

References

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. M.K. Venkataraman, Engineering Mathematics Vol. II -3rd year Part A & B, National Publishing Company.
3. Ian N.Sneddon, Elements of Partial Differential Equations,Mc Graw Hill International Edn.

4. Richard A Johnson, Miller and Fread's Probability and statistics for engineers, Pearson Education Asia / PHI.
5. Bali and Iyengar, A text book of Engineering Mathematics (Volume II), Laxmi Publications Ltd.
6. Erwin Kreyszig, Advanced Engg. Mathematics, Wiley Eastern Ltd.
7. Hogg and Tanis, Probability and statistical inferences, Pearson Education Asia.

FLUID MECHANICS - II

C402 **2+2**

Module 1

Flow in open Channel – Uniform and non uniform flow, equations for uniform flow – Chezy's and Manning's formula, Most economical cross sections – Velocity distribution in open channels, Conveyance of a canal section, Normal depth, computation of uniform flow, Energy in open channel flow, specific energy, specific force diagrams, critical velocity, critical states of flow, Froude number, measurement of discharge in channels.

Module 2

Gradually varied flow – Dynamic Equation for gradually varied flow, Different forms of the dynamic equation, Characteristics of surface profiles in prismatic channels, backwater computation by direct step method.

Module 3

Rapidly varied flow, hydraulic jump – initial and sequent depths, non-dimensional equation, Practical application of hydraulic jump, Types of jump in horizontal floor, Basic characteristics of the jump, Energy loss, efficiency, height of jump, jump as energy dissipater, stilling basins, Location of hydraulic jump.

Module 4

Hydraulic Machines – Impact of jet, Force of jet on stationary and moving plates – turbines – Classification, velocity triangle for Pelton, Francis, Kaplan turbines, Specific speed, selection of turbines, draft tube – types, Penstock, surge tank – types, tail race.

Module 5

Centrifugal Pumps – Types, Velocity triangle for pumps, Head of pump, Losses and efficiency, Minimum starting speed, Specific speed, Multistage pump, Pumps in parallel. Positive displacement pumps – working principle, types of reciprocating pumps, work done, effect of acceleration and frictional resistance, slip and coefficient of discharge. Indicator diagram, separation in suction and delivery pipes. Air vessel – rate of flow into and from air vessel.

References

1. Ven Te Chow, Open Channel Hydraulics, Mc Graw Hill Ltd.
2. K. Subrahmanya, Flow in open channel vol.1, Tata McGraw Hill, New Delhi
3. Dr. P. N. Modi & Dr. S. M. Seth, Hydraulics & Fluid Mechanics, Standard Book House, Delhi.
4. Jagadheesh Lal, Hydraulic Machines, Metropolitian Book Co., New Delhi.

STRUCTURAL ANALYSIS - I

C403 **2+2**

Module 1

Deflection of determinate beams: Differential equation of the elastic curve-slope and deflection of beams by method of successive integration-Macaulay's method- moment area method-conjugate beam method-deflection due to shear.

Module 2

Energy Theorems: Strain energy due to axial load-bending-shear and torsion-principle of super position-principle of virtual work-Castigliano's first theorem-Betti's theorem-Maxwell's law of reciprocal deflection-unit load method and strain energy method for determination of deflection of statically determinate beams-pin jointed frames-effect of temperature-lack of fit.

Module 3

Moving loads and influence lines: effect of moving loads-influence lines for reaction, shear force and bending moment for determinate beams-load position-absolute maximum bending moment.

Module 4

Arches: Theoretical arch-Eddy's theorem-analysis of three hinged arches – moving loads on arches-settlement and temperature effect.

Module 5

Cables and suspension bridges: General cable theorem-analysis of cables under concentrated and uniformly distributed loads-shape and stresses due to self weight-anchor cables-temperature effect-suspension bridges with three hinged

and two hinged stiffening girders-influence lines for bending moment and shear force-temperature stresses in stiffening girder.

References

1. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.1996.
2. Smith J.C. Structural Analysis, Macmillian Pub.Co.1985.
3. Rajesekharan &Sankarasubramanian,G., Computational Structural Mechanics, Prentice Hall of India, 2001.
4. Wang C.K.& Solomon C.G., Introductory Structural Analysis, McGraw Hill.1968.
5. Sadhu Sindh, Strength of Materials, Khanna Publishers, 1988.
6. Seeli F.B.& Smith J.P., Advanced Mechanics of Materials, John Wiley &Sons, 1993.
7. Norris & Wilbur, Elementary Structural Analysis, McGraw Hill.
8. Junarker S.R., Mechanics of Structures, Vol. II, Charorbar Book Stall.
9. Timoshenko S.P, Young D.H., Theory of structures, McGraw Hill
10. Thadani B.N, Desai J.P, Structural mechanics, Weinall Book Corporation.
11. Punmia B.C., Strength of materials and theory of structures, Vol.II, Laxmi publications.

ENGG. ECONOMICS AND CONSTRUCTION MANAGEMENT

C 404 ***2+2***

Part A

Engineering Economics

Module 1

Indian Industries: Industrial pattern-Industrial growth-Inadequacies of the program of industrialisation-Role of the public sector-problems and prospects of privatization-multinational corporations and their impacts on the Indian economy-inflation-demand pull and cost push-effects of price increases.

Module 2

Accountancy: Objectives of accounting – management accounting and financial accounting – journal – ledger – the trial balance – balance sheet – profit and loss account.

Module 3

Financial management: The Indian financial system – types of banks and their functions – long term financing – the stock market – functions and problems faced by the stock market – Industrial finance – loans and return of loans – cost benefit analysis – methods of appraising profitability – pay back method – average rate of return – internal rate of return – net present value.

Part B
Construction Management

Module 4

Introduction to job planning and Management: Bar charts and mile stone charts - work breakdown structure - C P M and PERT networks - Network and time estimates - Earliest expected time - Forward pass and backward pass - Time estimates - related problems.

Module 5

Project costs analysis: Cost Vs Time curve - optimum duration- related problems - updating, resource allocation - resource smoothing – resource leveling - Network compression - Compression limited by crashing - float- parallel critical paths - crashed critical paths – most economical solution.

Module 6

Industrial Relations: Payment of wages Act - Minimum wages Act - Employees State Insurance Act –Workers participation in management – labour welfare and social security – Industrial safety and welfare provision – role of state in labour welfare – role of labour welfare officers social security principles and practice.

References

1. A.N.Agarwal, Indian economy, Wishwa prakashan.
2. Prasanna Chandra, Fundamentals of financial management, Tata McGraw Hill.
3. Ruddar Datt, K.P.M. Sundaram, Indian economy, S.Chand &Co.
4. James.D.Steevens, Techniques for Construction Network Sheduling, McGraw Hill.
5. S.C.Sharma, Management of Systems, Khanna Publishers.
6. T.R.Banga, S.C.Sharma, Industrial Organisation and Engineering Economics, Khanna Publishers.
7. L. S. Srinath, PERT and CPM Principles and Applications, East – West Press.

SURVEYING - II

C405 **3+2**

Module 1

Triangulation: triangulation figures – classification of triangulation systems – selection of triangulation stations – intervisibility and heights of stations – station marks – signals and towers – base line – choice – instrument and accessories – measurement of base lines – corrections – satellite stations – need, reduction to centre – extension of base.

Module 2

Theory of errors and triangulation Adjustments: Kinds of error – laws of weights – principles of least squares – determination of most probable value of quantities – probable error – distribution of error to the field measurements – normal equation – Method of corrections – Adjustment of simple triangulation figures.

Module 3

Hydrographic surveying – Equipment – Methods of locating soundings – reduction and plotting of soundings – use of sextants and station pointer. Geodesy – shape of earth – effects of curvature – spherical excess – convergence of meridians.

Module 4

Terrestrial photogrammetry – General principles – photo theodolite – horizontal position of a point from photogrammetric measurements – elevation of a point – determination of focal length of lens. Aerial photogrammentry – aerial camera – scale of vertical photograph – relief displacement on a vertical photograph – principle of parallax – stereoscopic pairs – flight planning – radial line method – flying height and overlaps – remote sensing – concepts of remote sensing – ideal remote sensing system.

Module 5

Field Astronomy: - Definitions – celestial sphere – co-ordinate systems – astronomical triangle – sidereal, apparent and mean solar time – corrections to astronomical observations – determination of azimuth, latitude and longitude – different methods.

References

1. T. P. Kanetkar and Kulkarni, Surveying and leveling Vol. II, A.V.G. Publications, Pune.
2. B. C. Punmia, Surveying and leveling Vol. II, Laxmi Publications (P) LTD, New Delhi.
3. Thoms M.Lillerand, Remote sensing and image interpretation, John Wiley & Sons, Inc. New York.
4. Dr. K.R. Arora, Surveying Vol. II, Standard Book House, New Delhi.

CIVIL ENGINEERING DRAWING - II

C406 **0+3**

Preparation of design, sketches and working drawings as per area and functional requirements.
Working drawings for

1. Residential buildings: Flat and pitched roof – cottages, bungalows and flats (single storied and double storied) (4 sheets)
2. Public buildings – schools, offices, libraries, restaurants, commercial complexes (3sheets)
3. Preparation of site plan and plan as per building rules. (2 sheets)
4. Plumbing: water supply and sanitary drawings for residential buildings. (1 sheet)

The student is expected to know local building rules and national building code provisions. The student is expected to prepare sketch design for clients and submission drawings for approval

References

1. Balagopal & T. S. Prabhu, Building drawing & detailing, Spades Publishers and distributors, Calicut.
2. Shah & Kale, Building Drawing, Tata Mc Graw Hill, New Delhi.
3. B.P.Varma, Civil Engineering drawing and House Planning, Khanna Publishers, Delhi.
4. Gurucharan Singh, Subhash Chander Sharma, Civil Engineering drawing, Standard Publishers distributors, Delhi.
5. National Building code, Kerala building byelaws.

HYDRAULICS LABORATORY

C407 **0+3**

PART A -FLOW

1. Study of taps, valves, pipe fittings, gauges, pitot tubes, watermeters and current meters.
2. Determination of metacentric height and radius of gyration of floating bodies.
3. Hydraulic coefficients of orifices and mouth pieces under constant head method and time of emptying method.
4. Calibration of venturimeter, orifice meter and water meter.
5. Calibration of rectangular and triangular notches.

6. Determination of Darcy's and Chezy's constant for pipe flow.
7. Determination of Chezy's constant and Mannings number for open channel flow.
8. Determination of discharge coefficient for Plug-Sluices.

PART B - MACHINERY

1. Study of centrifugal, self priming and reciprocating pumps; impulse and reaction turbines
2. Performance characteristics of centrifugal pump.
3. Performance characteristics of reciprocating pump.
4. Performance characteristics of self priming pump.
5. Performance characteristics of Pelton wheel .
6. Performance characteristics of Francis turbine.
7. Performance characteristics of Kaplan turbine.

SURVEYING PRACTICAL - II

C408 **0+3**

1. Measurement of vertical angles using theodolite.
2. Solution to problems on heights distances by observations using a theodolite.
3. Traversing using a theodolite – distribution of errors using gale's traverse table.
4. Determination of constants of the transit theodolite.
5. Heights and distances – using the stadia Tacheometer Principles.
6. Heights and distances – using tangential tachometry.
7. Setting out a simple circular curve by offsets from long chord.
8. Setting out a circular curve by Rankine's method.
9. Setting out a building – Foundation marking.
10. Study of total station.

5TH SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	CMELPA501	Engineering Mathematics -IV	50	100	-	150
B	C502	Design of concrete structures –I	50	100	-	150
C	C503	Structural Analysis – II	50	100	-	150
D	C504	Computer programming	50	100	-	150
E	C505	Engineering Geology	50	100	-	150
F	C506	Geo Technical Engineering – I	50	100	-	150
G	C507	Computing Techniques Lab	50	-	100	150
H	C508	Geo Technical Engineering Lab	50	-	100	150
Total			400	600	200	1200

ENGINEERING MATHEMATICS - IV

CMELPA501 **3+1+0**

Module 1

Complex Integration: Line Integral –Cauchy's integral theorem- Cauchy's integral formula-Taylor's series-Laurent's series- zeros and singularities-Residues- residue theorem-Evaluation of real integrals using contour integration involving unit circle and semicircle.

Module 2

Numerical solution of algebraic and transcendental equations: Successive bisection method-Regula falsi method - Newton –Raphson method – solution of system of linear equations by Jacobi's iteration method and Gauss-Siedel method.

Module 3

Numerical solution of ordinary differential equation: Taylor's series method-Euler's method –Modified Eulers method - Runge – Kutta method (IV order)-Milne's predictor corrector method.

Module 4

Z – Transforms: Definition of Z transform- properties –Z transform of polynomial functions – trigonometric functions, shifting property, convolution property- inverse transform – solution of 1st & 2nd order difference equations with constant coefficients using Z transforms.

Module 5

Linear programming: graphical solution – solution using simplex method (non – degenerate case only) – Big-M method,two phase method- Duality in L.P.P.- Balanced T.P. – Vogels approximation method – Modi method.

References

1. Ervin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern limited.
2. Dr. B.S.Grewal, Numerical methods in Engineering & Science, Kanna Publishers.
3. Dr. B.S.Grewal, Higher Engineering Mathematics, Kanna Publishers.
4. Dr. M.K.Venkitaraman, Numerical methods in Science & Engineering, National Publishing Company.
5. P.C.Tulsian & Vishal Pandey, Quantitative techniques Theory & Problems, Pearson Education Asia.
6. Churchill and Brown, Complex variables and applications, McGraw-Hill.
7. Panneer Selvam, Operations research, PHI.
8. S Arumugam, A.T.Isaac & A Somasundaram, Engineering Mathematics Vol. III, Scitech publications
9. T.K.M.Pillai, G.Ramanaigh & S.Narayanan, Advanced Mathematics for Engg. Students Vol. III- S.Vishwananthan printers & publishers.

DESIGN OF CONCRETE STRUCTURES - I

C502 **2+2**

Module 1

Working stress method: Introduction- permissible stresses-factor of safety – behaviour of R.C.C beams –assumptions-under reinforced –over reinforced and balanced sections. Theory of singly and doubly reinforced beams.

Module 2

Limit state method: Concepts-assumptions –characteristic strength and load-partial safety factors-limit states-limit state of collapse –limit state of serviceability. Theory of singly and doubly reinforced rectangular sections in flexure-design of simply supported and flanged beams.

Module 3

Behaviour and design of one way and two way slabs-Continuous slabs-analysis using method recommended by BIS -arrangements of reinforcement in slabs. Design of flat slab.

Module 4

Design of columns: Limit state method- I S specifications-design of columns with lateral and helical reinforcement-members subjected to combined axial load and bending.

Module 5

Design of footings-Isolated footing with axial and eccentric loading-combined footing. Stair cases-introduction to different types-design of simply supported flights-cantilever steps.

References

1. Relevant IS codes. (I.S 456, I.S 875,SP 16)
2. Park R and Pauloy T, Reinforced concrete structures, John Wiely & sons Inc.
3. Purushothaman P, Reinforced concrete structural elements-Behaviour, Analysis and Design, Tata McGraw Hill publishing company Ltd.
4. Unnikrishna Pillai S. & D.Menon, Reinforced concrete design, Tata McGraw Hill Publishing company Ltd.
5. Mallick S.K., Reinforced concrete, Oxford & IBH Publishing company.
6. Varghese P.C., Limit state design of Reinforced concrete, Printice Hall of India Pvt Ltd.
7. Ashok .K. Jain, Reinforced concrete- Limit state design, New Chand & Bose.

STRUCTURAL ANALYSIS - II

C503 **2+2**

Module 1

Statically indeterminate structures-degree of indeterminacy-force and displacement methods of structural analysis. Force method of analysis of indeterminate structures - Method of consistent deformation-analysis of fixed beams and continuous beams. Clapyron's theorem of three moments- analysis of fixed and continuous beams Minimum strain energy-Castigliano's second theorem-analysis of indeterminate beams, portal frames and trusses.

Module 2

Displacement method of analysis of statically indeterminate structures: Slope deflection method-fundamental equations-analysis of continuous beams & portal

frames (with sway and without sway) - Moment distribution method-analysis of continuous beams & portal frames (with sway and without sway).

Module 3

Theories of Elastic Failure: Maximum principal stress theory- maximum shear stress theory - maximum principal strain theory – Mohr's theory. Influence line diagrams for statically indeterminate structures: Muller Breslau's principle-Influence lines for reactions-shear force-bending moment-propped cantilever-continuous beams and fixed beams

Module 4

Matrix methods: Classification of structures-static& kinematic indeterminacy Stiffness method-coordinate systems-element stiffness matrix - Direct stiffness method - structure stiffness matrix-assembly of structure stiffness matrix from element stiffness matrix-equivalent joint load – incorporation of boundary conditions –analysis of beams and frames (rigid & pinjointed).

Module 5

Flexibility method: Flexibility influence coefficients - flexibility matrix-analysis of beams & frames (rigid and pinjointed).

References

1. Weaver &Gere, Matrix Analysis of Structures, East West Press.
2. Moshe F. Rubinstein – Matrix Computer Analysis of Structures- Prentice Hall, 1969.
3. Meek J.L., Matrix Structural Analysis, McGraw Hill,1971.
4. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.1996.
5. Smith J.C. Structural Analysis, Macmillian Pub.Co.1985.
6. Rajesekharan & Sankarasubramanian,G., Computational Structural Mechanics, Prentice Hall of India, 2001.
7. Mukhopadhyay M., Matrix Finite Element Computer and Structural Analysis, Oxford & IBH,1984.
8. Wang C.K.& Solomon C.G., Introductory Structural Analysis, McGraw Hill.1968.
9. Pezemieniecki, J.S, Theory of Matrix Structural Analysis, McGraw Hill Co., 1984
10. Sadhu Sindh, Strength of Materials, Khanna Publishers, 1988.
11. Seeli F.B.&Smith J.P., Advanced Mechanics of Materials, John Wiley &Sons, 1993.
12. Norris & Wilbur, Elementary Structural Analysis, McGraw Hill.
13. Junarker S.R., Mechanics of Structures, Vol. II, Charorbar Book Stall.

COMPUTER PROGRAMMING

C 504 **2+2**

Module 1

Basic concepts of operation of a computer: Operating system - drives, directories and files - types of files -COM, EXE, BAT - booting - operating system commands - creating, editing, listing and copying files - different levels of programming languages - high level languages - compilers and interpreters - compiling, linking and running - structured programming - program planning - algorithms, flowcharts - simple examples.

Module 2

Introduction to C language: Character set -operators - constants and variables - data types - use of control statements - if, for, while, do-while, switch - conditional assignment - use of built in l/O functions - writing small programs.

Module 3

Functions: Declaration - passing parameters by value and by reference - writing trigonometric, algebraic and string handling functions - recursion – scope rules - storage classes - macros.

Module 4

Arrays: Declaration and handling - sorting - pointers and arrays - pointers as parameters to functions - structures and unions - array of structures - sorting of strings - linked lists.

Module 5

Data files: Reading, writing and appending data files - binary files - transfer of data in blocks - command line arguments - operation on files at command line.

References

1. Balaguruswamy, Programming in C, Tata Mc Graw Hill.
2. Kern Ingham & Ritchie, The C programming language, Prentice Hall.
3. Byron S Gottfried, Programming with C, Tata Mc Graw Hill.
4. Y. Kenetker, Let us C, BPB Publications.
5. V. Rajaraman, Programming with C.
6. Y. Kenetker, Exploring C, BPB Publications.

ENGINEERING GEOLOGY

C 505 **3+1**

Module 1

Introduction: Various branches of geology - Relevance of Geology in Engineering. Geologic time scale.

Physical Geology: Geomorphic processes-Rock weathering-Formation of soils-soil profiles-soils of India – Geologic work and engineering significance of rivers and oceans.

Module 2

Dynamic Geology: Interior constitution of the earth-Various methods to study the interior-crust, mantle, core-lithosphere-asthenosphere-major discontinuities-Moho, Guttenberg, Lehmann- composition of different layers-sima & sial.

Plate tectonics: Lithospheric plates-diverging, converging and transform boundaries-their characteristic features-midoceanic ridge, benioff zone and transform faults-significance of plate tectonic concept.

Earthquake: Elastic rebound theory-types of seismic waves-cause of earthquake-intensity and magnitude of earthquake-Locating epicentre and hypocenter-effect of earthquake-distribution of earthquake-earthquake resistant structures.

Module 3

Mineralogy: Definition and classification-important physical properties of minerals-colour, streak, lusture, transperancy, cleavage, fracture, hardness, form, specific gravity and magnetism. Study of the diagnostic physical properties and chemical composition of the following rock forming minerals: 1.Quartz, 2.Feldspar, 3.Hypersthene, 4.Auguite, 5. Hornblende, 6. Biotite, 7.Muscovite, 8.Olivine, 9.Garnet, 10.Fluorite, 11.Tourmaline, 12.Calcite, 13.Kyanite, 14. Kaolin, 15. Serpentine.

Petrology: Definition and classification-important structures and textures of igneous sedimentary and metamorphic rocks-diagnostic texture, mineralogy, engineering properties and uses of following rocks:

Igneous rocks: 1. Granite, 2. Syenite, 3. Diorite, 4. Gabbro, 5. Peridotite, 6.Dolerite, 7.Basalt 8.Pegmatite.

Sedimentary rocks: 1. Conglomerate, 2. Breccia, 3. Sandstone, 4. Limestone, 5. shale.Metamorphic rocks: 1. Gneiss, 2. Schist, 3. Slate, 4. Marble, 5. Quartzite, 6. Mylonite, 7. Pseudotachyllite.

Special Indian rock types: 1. Charnockite, 2. Khondalite, 3. Laterite.

Module 4

Structural Geology: Definition-outcrop-stratification-dip and strike. Folds-definition- parts of fold-classification-recognition of folds in the field- Faults-definition-parts of a fault-classification-recognition in the field-effects of faulting and subsequent erosion on outcrops. Joints-definition-classification. Unconformites-definition-classification recognition in the field. Effects of all the

above described structures in the major engineering projects like reservoirs, dams, tunnels and other important structures.

Module 5

Engineering Geology: Mass movement of earth materials-Landslides-definition, classification, causes of land slides and their corrections-Geological considerations in the selection of sites for reservoirs and dams. Geological considerations in Tunnel constructions and mountain roads-rocks as building materials.

Hydrogeology: Groundwater table-abundance and advantages-aquifer-acquiclude-acquifuge-artesian conditions and artesian wells-cone of depression–perched water table.

Recommended field work: Field trip to quarries or geologically significant places to learn - in site character of rocks in quarries/outcrops-measuring strike and dip of a formation-tracing of outcrops.

References

1. Arthur Holmes, Physical geology, Thomas Nelson.
2. Parbin Singh, Engineering & general geology, K.Katria & sons, New Delhi.
3. HH.Read, Rutleys elements of mineralogy, George Allen & Unwin Ltd, London.
4. G.W.Tyrell, Principles of petrology, B.I. Publications, Bombay.
5. M.P.Billings, Strucutural geology, Aisa publishing house, New Delhi.
6. Krynine&Judd, Engineering geology & geotechniques, Tata McGraw hill, New Delhi.
7. David Keith Todd, Groundwater hydrology, John Wiley & sons, New York.

GEOTECHNICAL ENGINEERING - I

C506 **3+1**

Module 1

Soil formation and soil types: Residual soil and transported soil-Soil structure-Basic structural units of clay minerals. Simple soil properties: three phase systems - void ratio - porosity - degree of saturation - moisture content - specific gravity - unit weight relationships.

Laboratory and field identification of soils: Determination of water content, specific gravity, determination of field density by core cutter and sand replacement method, grain size analysis by sieve, hydrometer and pipette analysis - Atterberg limits and indices - field identification of soils. Classification of soils: Principles of classification - I. S. classification - plasticity chart - Sensitivity and thixotropy.

Module 2

Permeability of soils: Darcy's law - factors affecting - constant head and falling head test - permeability of stratified deposits. soil- water system - classification of soil water - capillarity of soils - principles of effective stress.

Seepage of soils: seepage pressure, critical hydraulic gradient - quick sand condition - flownet diagram for isotropic and anisotropic soils - phreatic line in earth dams - exit gradient- protective filters.

Module 3

Shear strength: Shear strength parameters - Mohr's circle – Mohr Coulomb strength theory -direct, triaxial, unconfined and vane shear tests- Drainage conditions - UU, CD and CD tests - choice of test conditions for field problems - measurement of pore pressure-critical void ratio and liquefaction.

Module 4

Compaction: Objects of compaction - proctor test and modified proctor test - concept of OMC and Max. dry density - Zero air void line - factors affecting compaction - effect of compaction on soil properties - field methods-.of compaction - control of compaction.

Stability of slopes: types of failures of soil slopes - Swedish circle method - (ϕ) = 0 analysis and C - (ϕ) analysis. Friction circle method -Taylor's stability number and stability charts.

Module 5

Compressibility and consolidation of soils: void ratio - pressure relationship - concept of coefficient of compressibility - coefficient of volume change and compression index - normally loaded and pre loaded deposits - determination of preconsolidation pressure - Terzaghi's theory of one dimensional consolidation - time rate of consolidation - time factor - degree of consolidation - square root time and log time - fitting methods - coefficient of consolidation - calculation of void ratio - height of solids methods and change in void ratio method - settlement analysis.

References

1. Murthy V. N.S, Soil Mechanics and Foundation Engineering, Nai Sarak, Delhi.
2. Jumkis A .R., Soil Mechanics, Calgotia Book Source Publishers.
3. Gopal Ranjan and A .S .R .Rao, Basic and Applied Soil Mechanics, New Age International Publishers.
4. Punmia B. C., Soil Mechanics and Foundation Engineering, Laxshmi Publications, New Delhi.
5. Arora K. R., Soil Mechanics and Foundation Engineering, Standard Publishers, Distributors.

6. V. Narasimha Rao and Venkatramaiah, Numerical Problems, Examples and Objective Questions in Geotechnical Engineering, Orient LongMan Publishers.
7. Lambe & Whitman, Soil Mechanics, John Wiely Publications.

COMPUTING TECHNIQUES LAB (C)

C 507 **0+3**

1. Familiarisation with the computer system - PCs - LAN Peripherals.
2. Fundamentals of operating system like DOS, WINDOWS etc.,(Use of files, directories, internal commands, external commands,editors and compilers.
3. Familiarisation with packages like Wordstar, dbase, lotus, MS Office.
4. Familiarisation with data processing packages like FOXPRO etc,.
5. Familiarisation of application softwares - like Grapher, Surfur, Hardward Graphics - 3.
6. Familiarisation of drawing Softwares - AUTOCAD, Auto Architect, 3D Studio.
7. Programming with C as per syllabus of computer programming.

GEOTECHNICAL ENGINEERING LABORATORY

C508 **0+3**

1. Determination of specific gravity, water content and particle size distribution by hydrometer method / pipette method.
2. Determination of field density of soil by sand replacement method and core cutter method.
3. Determination of Atterberg limits.
4. Proctor's compaction tests (light and heavy).
5. Permeability tests for cohesive and cohesionless soil.
6. Direct shear test.
7. Triaxial shear test.
8. Unconfined Compression test.
9. Vane shear Test.
10. Consolidation test.
11. Study on Collection and Field Identification of Soil and Sampling Techniques.

6TH SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	C601	Structural Analysis – III	50	100	-	150
B	C602	Design of Steel structures	50	100	-	150
C	C603	Transportation Engineering -I	50	100	-	150

D	C604	Water Resources Engineering - I	50	100	-	150
E	C605	Geo Technical Engineering – II	50	100	-	150
F	C606	Quantity surveying	50	100	-	150
G	C607	Material testing lab - II	50	-	100	150
H	C608	Computer Aided Design -I	50	-	100	150
Total			400	600	200	1200

STRUCTURAL ANALYSIS - III

C601 **2+2**

Module 1

Approximate methods of frame analysis: Frames under lateral loading-portal method – cantilever method. Frames under vertical loading –substitute frame method. Space frames – tension coefficients-tension coefficient method applied to space frames

Module 2

Kani's method-continuous beams & frames (with and without sway). Beams curved in plan- analysis of cantilever beam curved in plan -analysis of curved balcony beams- analysis of circular beams over simple supports.

Module 3

Elementary theory of elasticity: State of stress at a point- stress tensor- equilibrium equations-stresses on arbitrary plane- transformation of stresses- principal stresses-strain components – strain tensor- compatibility equations- boundary condition equations- octahedral stresses.

Module 4

Two dimensional problems- plane stresses - plane strain – compatibility equations in two dimensional cases- Airy's stress functions- biharmonic equations- equilibrium equations in polar coordinates – compatibility equation and stress functions in polar coordinates- bending of cantilever loaded at ends.

Module 5

Plastic theory – ductility of steel- plastic bending of beams- evaluation of fully plastic moment – plastic hinge – load factor – method of limit analysis- basic theorems- collapse load for beams and portal frames.

References

1. Timoshenko S.P., Theory of Elasticity, McGraw Hill.
2. Sreenath, Advanced Mechanics of Solids
3. Sadhu Sindh, Strength of Materials, Khanna Publishers, 1988.
4. Seeli F.B.&Smith J.P., Advanced Mechanics of Materials, John Wiley & Sons, 1993.
5. Vazirani & Ratwani, Analysis of Structures, Khanna Publishers, New Delhi.
6. B.C. Punmia, Theory of Structures, Vol. II, Laxmi Publishers, New Delhi.
7. P.S.David, Analysis of continuous beams and rigid frames
8. Coats, Coutie, & Kong, Structural Analysis, ELBS & Nelson, 1980.
9. Kinney J.S., Indeterminate Structural Analysis, McGraw Hill, 1957.
10. Prakash Rao D.S., Structural Analysis, Universal Press Ltd, Hyderabad, 1997.

DESIGN OF STEEL STRUCTURES

C602 **2+2**

Module 1

Loading standards - I.S structural sections - I.S specifications - design of tension members - riveted and welded connections - design of simple and compound beams - laterally supported and unsupported.

Module 2

Compression members - design of columns - short and long columns - axial and eccentric loading - built up columns-moment resisting connections - lacing and battening - column base - slab base - gusseted base - grillage foundation.

Module 3

Water tanks - rectangular, circular and pressed steel tanks – connections - analysis and design of supporting towers.

Module 4

Light gauge steel structures - introduction - type of sections - local buckling -stiffened and multiple stiffened elements - beams with and with out lateral supports.

Module 5

Chimneys- types - self supporting & guyed – stresses in chimneys – design of chimney stack, breech opening, base plate, connections and foundations.

References

1. Relevant I.S Codes. (I.S 800, I .S 875, Steel Tables)
2. Ramamrutham S, Design of steel and timber structures, Dhanpat Rai & sons, Delhi.
3. Ramchandra, Design of steel structures Vol. I & II, Standard book house, Delhi.
4. Gaylord & Gaylord, Design of steel structures, Tata McGraw-Hill.
5. Graham W. Owens& Peter .R. Knowles, Steel Designers Manual, Blackwell scientific publications.
6. B.C.Punmia, Design of steel structures, Laxmi publications.

TRANSPORTATION ENGINEERING - I

C603 **3+1**

Module 1

Introduction: Comparison of highway and railway. Modern developments - Surface elevated and tube railways.

Design of railway track: Component parts of a railway track - their requirements and functions - Typical cross section - conning of wheels - wear and creep of rails - rail fastenings - Train resistances and evaluation of loading capacity.

Geometric design of railway track: Horizontal curves, radius – super elevation - cant deficiency - transition curves - gradients - different types - Compensation of gradients.

Module 2

Railway operation and control: Points and Crossings – Design features of a turn out - Types of railway track - Functions - Details of station yards and marshalling yards - Signaling and interlocking - Principles of track circuiting - Control of train movements by absolute block system - automatic block system - centralised traffic control systems.

Module 3

Tunnel Engineering: Tunnel sections - types, size and shapes - tunnel surveying - alignment, transfering centre, grade into tunnel - tunnel driving procedure - tunnelling through soft soil (Fore Poling Method) and tunneling through hardsoil (Cantilever Car Dump Method) Tunnel lining, ventilation - lighting and drainage of tunnels.

Module 4

Harbour Engineering: Classification of harbours and the effect of tides, winds and waves in the location and design of harbours; Break waters - necessity and functions - different types - forces acting on break water - design principles— construction of break waters - general study of pier heads - quays, landing stages - wharves, jetties, transit sheds and warehouses - channel demarcation - signal characteristics (Beacons, buoys, channel lighting - light houses).

Module 5

Dock Engineering: Functions and types of docks, dry docks, floating docks, slip ways, dock gates and caissons. Dredging - mechanical and hydraulic dredgers - general study of bucket ladder - dredger, grab dredger and dipper dredgers.

References

1. S.C. Rangawala, Railway Engineering, Chartor Publishing House
2. Saxena, Arora., Railway Engineering, Dhanpat rai & Sons
3. Subhash C. Saxena, Railway Engineering, Dhanpat rai & Sons
4. R. Srinivasan, Harbour, Dock & Tunnel Engineering, Chartor Publishing House
5. S.P.Bindra, Acourse in docks and Harbour Engineering, Dhanpat rai & Sons

WATER RESOURCES ENGINEERING - I

C604 **3+1**

Module 1

Irrigation: Definition-necessity of irrigation - environmental effects of irrigation - sources of water - planning concepts of irrigation schemes- irrigation systems- lift and flow irrigation – modes of irrigation - layout of irrigation schemes - historical development and irrigation in India through ages. Soil-water-plant relation – classes and availability of soil water- water requirement for crop - optimum moisture for crop growth - depth of water and frequency of irrigation - crop seasons and important crops in India. Crop period and base period - duty, delta and their relationship - factors affecting duty - commanded areas and intensity of irrigation. Consumptive use of water - evapotranspiration - determination of consumptive use - irrigation efficiencies.

Module 2

Basic concepts of hydrology: Hydrological cycle and its components - rainfall - rain gauge- mean precipitation over a catchment area - run off - factors affecting runoff - hydrograph - direct run off and base flow - unit hydrograph - S. hydrograph – applications of unit hydrograph.

Estimation of runoff: Empirical formula, infiltration method, rational method - flood estimation - flood frequency, unit hydrograph method and empirical formula.

Module 3

Flow irrigation: canal system - classification of canals and their alignment - requirements of a good distribution system-balancing depth - section of canal. Design of canals in alluvial soils - silt theories - non silting and non scouring velocity. Kennedy's theory -Lacey's theory - design of unlined canal using the two theories in alluvial soils - bed load and suspended load - canal outlets - requirements of good canal outlets - non modular - semi modular - modular outlets.

Module 4

Ground water: Definitions- porosity - specific yield - specific retention - storage coefficient-coefficient of permeability and transmissibility. Ground water velocity- Darcy's equation - flow towards wells - Dupit's theory of aquifers. Wells-shallow wells - deep wells - yield of an open well - constant level pumping test and recuperation test - tube wells - strainer, cavity and slotted tube wells- factors governing the selection of site and type of tube wells. Springs, Infiltration galleries and wells.

Module 5

Reservoir planning: Investigation - selection of site - storage zones in a reservoir - mass inflow curve - demand curve - calculation of reservoir capacity

and safe yield from mass inflow curve - reservoir sedimentation - reservoir sediment control - single purpose reservoirs - multi purpose reservoirs - useful life of a reservoir. River training works: guide banks, groynes and marginal bunds – flood control - causes - methods of flood control - principles of flood routing. Soil conservation: water logging and its control - reclamation of salt affected land.

References

1. P.M.Modi, Irrigation-water recourses and water power, Standard book house, Delhi.
2. S.K Garge, Irrigation and hydraulic structures, Khanna Publishers, Delhi
3. R.K.Linsley, M.A.Kholar&J.L.H.Paulhur, Hydrology for Engineers, Mc Grawhill book co., New York.
4. Bharat Singer, Fundamentals of Irrigation Engineering.
5. V.B.Priyani, Irrigation and Waterpower Engg, Charota Book stall Anand.
6. Dr.B.C.Punmia&Dr.Pande.B.B.Lal, Irrigation & Water Power Engineering, Laxmi Publications.

GEO TECHNICAL ENGINEERING - II

C 605 **3+1**

Module 1

Site investigation and Soil exploration: Objectives - planning - reconnaissance methods of subsurface exploration-test pits, auger borings - rotary drilling - depth and spacing of borings - bore log - soil profile - location of water table-sampling - disturbed and undisturbed samples. Standard Penetration test - Static and dynamic cone penetration test - field vane shear test - Geophysical methods.

Stress Distribution: Boussinesque's and Westergaard's equations for vertical pressure due to point loads and u.d.l. - assumptions and limitations - pressure bulb - Newmark charts and their use.

Module 2

Earth Pressure: General & local State of plastic equilibrium. Earth pressure at rest - active and passive. Rankine's and Coulomb's theories of cohesionless and cohesive soils - influence of surcharge and water table.

Rehban's and Culman's graphical methods: Sheeting and bracings in shallow and deep excavations.

Sheet Piles: Common Types of Sheet Piles – Uses of Sheet pile walls

Module 3

Bearing capacity: Definitions - ultimate and allowable - plate load test - factors affecting - Terzaghi's and Skempton's analysis - bearing capacity factors and charts - effect of watertable - bearing capacity from building codes andSPT values - Methods of improving bearing capacity - vibroflotation and sand drains.

Settlement analysis: Distribution of contact pressure estimation of immediate and consolidation settlement - causes of settlement - permissible, total and differential settlement - methods of reducing differential settlement.

Module 4

Foundation: General consideration - Functions of foundation - shallow and deep foundation - different types of foundation -Selection of type of foundation-steps involved.

Footings: Design of individual, continuous and combined footings - footings subjected to eccentric loading - proportioning footings for equal settlement.

Module 5

Raft foundation: Bearing capacity equations - design procedure - floating foundation.

Pile foundation: Uses of piles - Classification of piles - Determination of load carrying capacity of axially loaded single vertical pile (static & dynamic formulae) pile load tests - negative skin friction - group action & pile spacings - settlement of pile group.

Caissons: Open, box, and pneumatic caissons, construction details of well foundation - problems of well sinking.

Note

Structural design of foundations is not contemplated in this course.

References

Arora K. R, Soil Mechanics & Foundation Engineering, Standard Publishers , Distributors.

1. Joseph E.Bowles, Foundation Analysis and Design, McGraw Hills Publishing Company.
2. Ninan P. Kurian, Modern Foundations, Tata McGraw Hills Publishing Company.
3. Peck, Hansen & Thornburn, Foundation Engineering.
4. W.C. Teng, Foundation Design.
5. Hans. F. Winterkorn & Hsai Yang Fang, Foundation Engineering Hand Book, Van Nostrand Reinhold Company.

QUANTITY SURVEYING VALUATION AND SPECIFICATIONS

C606 **2+2**

Module 1 & 2 (24 hrs.)

Purpose of estimates- different methods-Preparation of detailed estimates and abstracts for RCC Single storey buildings - R C. Footings, Columns – T- Beams. Preparation of bar bending schedule for R. C. works such as beams and slabs.

Module 3 (8 hrs.)

Preparation of specification for common materials of construction and its items of works with reference to IS specifications. Cost of materials at source - different types of conveyance and rates - head loads - preparation of conveyance statement - cost of materials at site.

Module 4 (8 hours)

Analysis of rates for earth works, mortars, RCC Works, plastering, brick works, stone works, laterite work, Pointing, form work, flooring - different types, wood works - reinforcement works.

Module 5 (6 hours)

Valuation - explanation of terms - material value, rate, years purchase - freehold and lease hold purchase - depreciation - methods of calculating depreciation - straight line method - constant percentage method, sinking fund method - and quantity survey method. Methods of valuation of land - comparative method - abstractive method. Methods of valuation of property - rental method - direct comparison with capital cost - valuation based on profit - valuation based on cost - development method - depreciation method.

References

1. Schedule of rates, KPWD
2. PWD Data Book
3. Dutta, Estimating and costing,S Dutta & Company, Lucknow
4. Rangawala S.C., Estimating & costing, Charator Anand, Delhi
5. I.S: 1200- 1968 - Methods of measurements of building and civil engineering.

MATERIAL TESTINGB LABORATORY - II

C607 **0+3**

1. **Tests on cement**.
    a) Standard consistency, initial and final setting time.
    b) Compressive strength of mortar cubes.
    c) Specific gravity.
    d) Soundness.
    e) Fineness.
2. **Tests on fresh concrete.**
    a) Compaction factor test.
    b) Slump test.
    c) Vee-Bee test.
    d) Flow table test.
    e) Ball penetration test.
3. **Tests on hardened concrete.**
    a) Compressive strength of concrete cubes.
    b) Compressive strength of concrete cylinder.
    c) Splitting tensile strength.
    d) Modulus of elasticity.
    e) Flexural strength.
4. **Tests on RC beam**
5. **Tests on aggregates.**
    a) Aggregate crushing value for coarse aggregate.
    b) Specific gravity of coarse and fine aggregate.
    c) Bulking of fine aggregate.
    d) Bulk density and percentage voids of coarse aggregate.
    e) Grain size analysis of coarse and fine aggregate.
6. **Tests on bricks.**
    a) Compressive strength. b) Water absorption. c) Efflorescence.
7. **Tests on roofing tiles.**
    a) Transverse strength. b) Water absorption.
8. **Tests on flooring tiles.**
    a) Transverse strength. b) Water absorption. c) Abration tests.
9. **Compression tests on Laterite blocks**
10. **Study of**
    a) Strain measurements using electrical resistance- strain gauges.
    b) Nondestructive test on concrete.

Note

All tests should be done as per relevant BIS.

COMPUTER AIDED DESIGN - I

C608 **0+3**

Module 1

History and overview of CAD- popular CAD packages – advantages of CAD over manual drafting and design – hardware requirements – Configuration and installation of the CAD package.

Module 2

Creation of 2D drawings: Menu structures- Menu bars, Screen menu, Pull down menu and Toolbars. Setting up units, limits, snap, grid, ortho mode etc. Controlling the drawing and drawing display – zoom, pan, regeneration, redraw. Drawing aids and tools - Osnap settings, point filters, inquiry commands, concept of UCS Modify tools – Erase, undo, redo, copy, move, rotate, offset, fillet, chamfer, array, scale, extend, break, explode, stretch, properties. Creation of blocks and symbols, using layers, color, linetype, ltscale etc. Dimensioning – Styles – Dim variables, scaling, formatting, annotation, QDIM adding text to drawing – multiline text, text styles, editing text. Working with multiple drawings, printing and plotting.

Module 3

Creation of 3D drawings: Concept of 3D Drawings, working with views in 3D using view point, Real-time 3D rotation, concept of UCS in 3D, multiple active work planes. 3D modeling techniques- wire modeling, surface modeling, surface revolution, tabsurf, rulesurf, edgesurf, and 3D face, region modeling, solid modeling, fillets and chamfer, editing faces of 3D solid & shelling. Calculating mass properties and interference Creating perspective and sectional perspective views of 3D models. Shading and rendering - assigning material, landscapes, mapping, lights and scenes etc.

Module 4

AutoLISP: Introduction of AutoLISP- Data types, signs and symbol conventions, user defined functions, variables and functions. Writing your own commands.

Module 5

1. Planning and designing of residential buildings (2D only)
2. Planning and designing of public buildings (2D only)
3. Term project – To prepare sketch design for Client and submission drawings for approval (Using National Building code provisions and Local Building rules)

References

1. Reference Manual of the package.
2. National building code of India.
3. Shah & Kale, Building Drawing, Tata McGraw Hill.
4. Balgopal T.S. Prabhu, Building Drawing and Detailing, SPADES, Calicut.
5. Sham Tickoo, Understanding AutoCAD 2002, Tata McGraw Hill.
6. Sham Tickoo, AutoCAD 2002 with Applications, Tata McGraw Hill.

7TH SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	C701	Design of Concrete Structures – II	50	100	-	150
B	C702	Water Resources Engineering - II	50	100	-	150
C	C703	Transportation Engineering –II	50	100	-	150
D	C704	Architecture and town planning	50	100	-	150
E	C705	Environmental Engineering - I	50	100	-	150
F	C706	Elective –I	50	100	-	150
G	C707	Transportation Engineering Lab.	50	-	100	150
H	C708	Computer Aided Design -II	50	-	100	150
Total			400	600	200	1200

DESIGN OF CONCRETE STRUCTURES - II

C701 **2+2+0**

Module 1

Prestressed concrete: I. S. Specifications - general principles - methods and systems of prestressing - losses of prestress - design of simply supported rectangular beams.

Module 2

Retaining walls: Types-Earth pressure diagrams- modes of failure- design of cantilever and counter fort retaining walls ("L" not included)

Module 3

Design of continuous beam: using coefficients given in IS: 456 - design of circular beams -uniformly loaded and supported on symmetrically placed columns.

Module 4

Domes: membrane stresses in spherical and conical domes –design of domes with uniformly distributed and concentrated loads - openings - ring beams.

Module 5

Water tanks: Types - design of ground supported and overhead water tanks- rectangular and circular with flat bottom-flexible and rigid joints – design of staging- columns and bracings - IS code method.

References

1. Relevant IS codes.(I.S 456, I.S 875,SP 16)

2. Park R and Pauloy T, Reinforced concrete structures, John Wiely & sons Inc.
3. Purushothaman P, Reinforced concrete structural elements-Behaviour, Analysis and Design, Tata Mc Graw Hill Publishing company Ltd.
4. Unnikrishna Pillai .S & D.Menon, Reinforced concrete design, Tata Mc Graw Hill Publishing Company Ltd.
5. Mallick S.K, Reinforced concrete, Oxford & IBH Publishing Company.
6. Varghese P.C, Limit state design of Reinforced concrete, Printice Hall of India Pvt Ltd.
7. Ashok .K. Jain, Reinforced concrete- Limit state design, New Chand & Bose.
8. Krishna Raju, Prestressed Concrete, Oxford and I B H Publishing companyLtd.
9. Ramamruthum S., Design of Reinforced concrete structures, Dhanpat Rai Publishing co.
10. Punmia B.C, Reinforced concrete structures Vol II, Lakshmi Publications

WATER RESOURCES ENGINEERING - II

C702 **3+1+0**

Module 1

Dams: definitions - classifications - factors governing the selection of the type of dam and site of the dam- investigation for a dam site. Gravity dam: forces acting - combination of forces for design - modes of failure and stability requirements - elementary profile and practical profile - principal and shear stress - base width of elementary profile by stress and stability criteria-stresses developed in the elementary profile - low dam and high dam - methods-of design of gravity darn (introduction only) - joints - keys water stops – opening and galleries and shaft - foundation treatment - brief description on type of spill ways.

Module 2

Arch dams: types of arch dams - forces acting -design of arch dams on thin cylinder theory - introduction of other methods of design - thick cylinder theory - trial load analysis and elastic theory. Buttress dam - types - advantages and disadvantages. Earthen dam - types of earth dams - design criteria - selection of a dam - phreatic line - stability analysis - different dam sections to suit available materials and foundation - rock fill dams materials of construction - impervious membrane type and earth core type (brief description only)

Module 3

Diversion head works: function and component parts of diversion head works - effect of construction of weir on the regime of river- causes of failure of weirs on permeable foundation. Bligh's creep theory and its limitations - Lane's weighted creep theory - Khosla's theory and design of impermeable foundation - design of vertical drop weir - silt control devices - silt excluder, silt ejector.

Module 4

Design and drawings emphasizing the hydraulic aspects of the following structures: (1) Regulators-design of head regulator and cross regulator. (2) Canal falls- trapezoidal notch fall- vertical drop fall sarda type and glacis fall. (3) Cross drainage works –aqueduct and syphon aqueduct.

Module 5

Water power engineering: Classification of hydel plants- runoff river plants, storage plants and pumped storage plants - low, medium and high head schemes - investigation and planning - fore bay – intakes - surge tanks - penstocks - powerhouse – selection of turbine-Scroll casing - draft tube - tailrace definition of gross head - operating head - effective head - firm power –secondary power- load factor, capacity factor and utilization factor.

References

1. P. M. Modi, Irrigation-water resourses and water power, Standard book house.

2. S. K.Garg, Irrigation and hydraulic structures, S. K.Garg, Khanna publishers
3. R. K. Linsley, M. A. Kholer, L. H. Paulhur, Hydrology for Engineerers, Tata Mc Graw Hill
4. Bharat Singer, Fundamentals of Irrigation Engineering
5. V. B. Priyani, Irrigation and water power Engg. , Charotar Book stall.
6. B C Punmia, Pande B B Lal, Irrigation and water power engineering, Laxmi Publications.
7. R.S.Varshney, S.C.Guptha, R.L.Guptha, Theory and design of irrigation
8. Structures, Vol II, Nemchand &brothers, Roorkee.

TRANSPORTATION ENGINEERING - II

C703

2+1+0

Module 1

Classification, alignment and surveys -classification of highways - historical development of road construction, typical cross section of roads in urban and rural areas - definitions of various cross sectional elements - requirements and factors controlling alignment of roads, engineering surveys for highway location.

Geometric design of highways: pavement surface characteristics, camber and width requirements, sight distances - over taking zone requirements and related problems. Design of horizontal alignment - speed - radius – super elevation - extra widening - transition curves, methods of attainment of super elevation - related problems.Design of vertical alignment - gradient and grade compensation - sight distance requirements on summit and valley curves -simple problems on design of vertical alignment.

Module 2

Traffic Engineering: traffic characteristics-various traffic studies and their applications . Traffic control devices- Traffic signs, markings, traffic signals and traffic islands. Types of road intersection - kerb parking - principles of highway lighting - (Design of traffic signals not expected).

Module 3

Highway materials: Road aggregates - their desirable properties and tests.
Bituminous materials - properties and tests - sub grade soil - desirable properties.

Highway construction and maintenance: Bituminous surface dressing and pavement construction - cement concrete construction and joints in concrete pavements - types and causes of failures in flexible and rigid pavements, highway drainage.

Pavement design: Basic difference between flexible and rigid pavements -factors affecting their design - designof flexible pavements-CBR, GI & IRC methods.

Module 4

Aircraft characteristics- regional planning, selection of site for airport - factors to be considered. Imaginary surfaces - approach zone and turning zone, obstructions and zoning laws. Runway orientation and layout of runways: use of wind rose diagrams, basic runway length and corrections required. Methods of classification of airports. Stopway, clearway and taxiway design requirements.

Module 5

Aprons: loading aprons - factors controlling size and number of gate positions - aircraft parking systems - holding apron. Facilities required in the terminal building - facilities for movement of baggage and passengers. Use of blast fences, typical airport layout - airport markings - marking of runways, taxiways etc. Airport lighting: lighting of runways approaches, taxiways and aprons. Air traffic control -airways, navigational aids and landing aids.

References

1. S. K.Khanna, C. E. G. Justo, Highway engineering, Nem Chand Publications.
2. L .R. Khadiyali, Traffic Engineering and Transport Planning, Khanna Publishers.
3. S.K. Khanna, M. G. Arora, S.S. Jain, Airport Planning & Design, Nem Chand Publishers
4. S. C. Rangwala, Airport Engg., Charotar Publishing Co.
5. Horenjeft, Robert & Francise Mc Keivy, Planning and design of airports, Mc Graw Hill
6. G V Rao, Principles of transportation and High way Engineering, Tata Mc Graw Hill, New Delhi.
7. Robert. G. Hennes, Martin Ekse, Fundamentals of Transportation engineering, Tata Mc Graw Hill.
8. Theodore M Matson, Wilbur.S.Smith, Frederick.W.Hurd, Traffic Engineering, Mc Graw Hill.

ARCHITECTURE AND TOWN PLANNING

C704 **2+1+0**

Module 1

Principles of architectural Design:

Definition of architecture: factors influencing architectural development- characteristic features of a style-historical examples. Creative principles: function/strength, aesthetics - deciding the space and form - detailed analysis of factors influencing the space - activity space, circulation space and tolerance

space - Factors influencing form- form perception - form expressive of function- form related with material and Structural system. Design principles - elements of composition - point, line, plane, texture, colour etc. - mass and scale, proportion, rhythm, balance and unity - iconic, canonic and analogic design -consideration of comfort factors such as acoustics, lighting, ventilation and thermal aspects.

Module 2

Functional planning of buildings: Occupancy classification of buildings'-general requirements of site and building - building codes and rules - licencing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - the process of identifying activity areas and linkages - drawing built diagrams - checking for circulation, ventilation, structural requirements and other constraints preparing sketch plan and working drawings - site plans.

Kerala Municipal acts – planning regulations of corporations and developmental authorities – Kerala building bye laws.

Module 3

Building services: Vertical Transportation: stairs - layout and details of different types of timber - masonry, steel and concrete stairs - pre-cast concrete stairs, elevators - types - traction, hydraulic operation - passenger, service goods elevators - design considerations of passenger elevators - handling capacity - arrangement of lifts - positioning, escalators, features- operation arrangement - ramps. Ventilation and air conditioning - ventilation requirements -natural and mechanical ventilation - air movement - cross ventilation - effect of orientation - radiation - evaporation, calculation of air conditioning load - summer and winter air conditioning. Plumbing services**:** typical details of water supply and sewage disposal arrangements for residence, hospitals and hostel buildings - standard requirements.

Module 4

Town planning theory: Evolution of towns: problems of urban growth - beginning of planning acts - ideal town - garden city movement - concept of new towns and conservative theory - comprehensive planning of towns- Survey and analysis of town: fare maps - land use classification - transportation network - housing demographic arid social surveys - economic studies - environmental aspects. Theories of land use planning, transportation planning and housing development.

Urban area lineation: urban influence zone - urban region concept of regional planning.

Module 5

Planning Process: Concept of master plan: structural plan, detailed town planning scheme and act.

Estimating future needs: planning standards for different land use allocation for commerce, industries, public amenities, open areas etc. planning standard for

density distributions-density zone, planning standards for traffic networks - standards of roads and paths - provision for urban growth-growth models. Plan implementation: town planning legislation and municipal acts - planning control development schemes - urban financing - land aquisitions - slum clearance schemes - pollution control aspects.

References

1. Banister Fletcher, History of World Architecture, Taraporevalas.
2. Broadbent, Theory of Architecture Design, John Wiley Sons
3. Gallien, Urban Pattern, D.Van Nostrand CD. Inc.
4. Nelson P. Low's, Planning to Modern City
5. Rangwala, Town Planning, Charotar Publishing House.

6. S.C Agarwala, Architecture and Town Planning, Dhanpatrai &sons.

ENVIRONMENTAL ENGINEERING - I

C705 **3+1+0**

Module 1

Scope of Environmental Engg. population trends resource use - effect on the balance of ecosystem and natural resources. Water supply Engineering: Rural and Urban water supply systems - water requirements - consumption for various purposes, percapita demand, factors affecting percapita demand, variations in the rate of consumption, fire demand, design period, forecasting population. Quality of water: impurities in water and their importance - water borne diseases - sampling of water for tests - analysis of water - physical, chemical and bacteriological tests - MPN total coliforms, fecal coliforms by A-1 medium. WHO and Indian standards for drinking water.

Module 2

Collection of water: intakes - location, types, principles of design and construction. Transmission of water: free flow and pressure conduits - pipe materials - hydraulics-of flow - design of pipes - Indian standards for pipes.

Pumps: Classification - rotary, reciprocating, centrifugal pumps, hand pumps submersible pumps - selection of pumps - location of pumping stations.

Distribution of water: pumping system, gravity system, pumping and storage system distribution reservoirs -storage capacity of balancing reservoir, pipe grids, methods of analysis of network. Appurtenances in the distribution system - meters, valves, fire hydrants etc. pipe laying, testing & disinfections of mains.

Detection and prevention of leaks in distribution system-cleaning and maintenance of distribution system, pipe corrosion and its control.
Water supply of buildings: house connections - overhead tanks.

Module 3

Introduction: Sanitation, sewage, sewer, and sewerage systems, sewage treatment and disposal. Sanitary Plumbing - Sanitary Fixtures, traps, soil pipe, anti- siphonage pipes, systems of plumbing. House drainage: Principles-inspection chamber, ventilation, testing of drain, connection of house drain to street sewer. Sewerage systems – separate, combined and partially combined systems, situation for adoption, collection pattern.
Quantity of sewage: sanitary sewage - sources, factors affecting. Fluctuations in sewage flow, peak factor.
Characteristics of sewage: physical, chemical and biological characteristics and analysis, sampling, population equivalent relative stability-cycles of decay.
Storm sewage: Factors affecting, intensity of rainfall, rational and empirical formula, time of concentration, intensity - duration curve and formula.
Design of sewers: Flow formula, minimum and maximum velocity of flow, effect of variation of discharge on velocity, use of partial flow diagrams, design of circular sewers, longitudinal and cross section of sewer lines.

Module 4

Construction of sewers: Materials of sewers, crown corrosion, sewer joints, planning, preparation of layout and construction of sewers and testing of sewers, cleaning and maintenance, ventilation of sewers. Sewer appurtenances: inlets, catch basins, clean outs, manholes, drop manholes, lamp holes/flushing tanks, grease and oil traps, inverted siphons, storm regulators. Sewage pumping: pumping stations - types of pumps - capacity of pumps - design of pumps.
Natural methods of wastewater disposal: land disposal -. Sewage farming - disposal by dilution - self purification of streams - oxygen sag curve - dilution into sea, comparison of disposal methods.

Module 5

Air pollution: Types of pollutants, sources, health effects, Monitoring.
Noise pollution: Sources, effects. Solid waste management: Type and source of solid waste, characteristics, collection, transportation and processing- Disposal-composting, sanitary land fill, incineration

References

1. Peavy, Rowe, Tchobanoglous, Environmental Engineering, Mc Graw Hill International Editions.
2. M.N. Rao & H.V.N. Rao, Air Pollution, Tata Mc Graw Hill Pvt. Ltd., New Delhi.

3. S. K. Garg, Environmental Engineering Vol. l & ll, Khanna Publishers, New Delhi.
4. B.C. Punmia, Water supply Engineering, Arihant Publications, Jodpur.
5. B.C. Punmia, Waste water Engineering, Arihant Publications, Jodpur.

OPTIMIZATION TECHNIQUES (ELECTIVE - I)

CMELRTA 706-1 **3+1+0**

Module1: **Classical optimization techniques**

Single variable optimization – Multivariable optimization with no constraints – Hessian matrix – Multivariable saddle point – Optimization with equality constraints – Lagrange multiplier method - Multivariable optimization with inequality constraints – Kuhn-Tucker conditions.

Module 2: **One-dimensional unconstrained minimization**

Elimination methods – unrestricted search method – Fibonacci method – Interpolation methods – Quadratic interpolation and cubic interpolation methods.

Module 3: **Unconstrained minimization**

Gradient of a function – Steepest descent method – Newton's method – Powells method – Hooke and Jeeve's method.

Module 4: **Integer – Linear programming problem**

Gomory's cutting plane method – Gomory's method for all integer programming problems, mixed integer programming problems**.**

Module 5: Network Techniques

Shortest path model – Dijkstra`s Algorithm – Floyd`s Algorithm – minimum spanning tree problem – PRIM algorithm – Maximal Flow Problem algorithm.

References

1. S.S. Rao, Optimization theory and application, New Age International P. Ltd.
2. A.D. Belegundu, T.R. Chandrupatla, Optimization Concepts and applications in Engineering, Pearson Education Asia.
3. F. S. Budnick, D. McLeavey, R. Mojena, Richard D, Principles of Operations Research for Management, Irwin, INC.
4. H. A. Taha, Operation Research an introduction, Eastern Economy Edition.
5. R. Panneerselvam, Operations Research, PHI.

THEORY OF PLATES (ELECTIVE - I)

C706-2 **3+1+0**

Module 1

Plates- Introduction- classification of plates- thin plates and thick plates – small deflection theory and large deflection theory – basic concepts of two imensional

theory of elasticity – fourth order differential equation for generalized bending problems (derivation in next module)

Module 2

Pure bending of plates – slope and curvature of slightly bent plates – relation between bending moment and curvature in pure bending – stresses – variation– plates subjected to lateral loadings -small deflection theory of thin plates – Love- Kirchhoff's theory – assumptions– derivation of fourth order differential equation

Module 3

Solution techniques for fourth order differential equation – boundary conditions – simply supported, built- in and free edge – Navier's solution for simply supported rectangular plates – uniformly distributed and concentrated load.

Module 4

Strain energy – pure bending of plate – bending of plates by lateral loads – Mindlin's theory – assumptions - equilibrium equations – stress variations – comparative study with Love- Kirchhoff's equations.

Module 5

Circular plates – polar coordinates – differential equation of symmetrical bending of laterally loaded circular plates- uniformly loaded circular plates – circular plates loaded at the centre

References

1. Lloyd Hamilton Donnell, Beams, plates and shells, Mc Graw Hill, NewYork.
2. Timoshenko, W Krieger, Theory of plates and shells, Mc Graw Hill.
3. Owen F Hughes, Ship structural design, John Wiley & Sons, New York, 1983.
4. William Muckle, Strength of ship structures, Edqward Arnold Ltd, London, 1967.

PRESTRESSED CONCRETE (ELECTIVE - I)

C706-3 **3+1**

Module 1

Introduction**:** Basic concept of prestressing - Advantages of prestressed concrete over reinforced concrete - materials for prestressed concrete and their characteristics. Uniform prestress distribution in prestressed concrete - nonuniform prestress distribution - moments of resistance.

Module 2

Systems and methods of prestressing**-** pre-tensioning systems - post tensioning systems - Thermo elastic prestressing - chemical prestressing.Behavior of

prestressed concrete beams in flexure **:** load - deflection curves for prestressed concrete beams - Interpreting bending tests - Microcracks and visible cracks - Failure.

Module 3

Losses in prestress: purpose of assessing losses - counteracting elastic loss-loss of prestress in case of nonuniform prestress - creep, shrinkage, relaxation and achorage losses - friction loss in prestress -graphical solution of friction losses - overcoming friction losses.

Module 4

Elastic design of sections for flexure**:** design of a simply supported beam with symmetrical sections of post tensioned and pretensioned type- tension members.

Module 5

Bearing and anchorage zone- statically indeterminate structure-continuous beams-primary moment –secondary moment- resultant moment – Concordant cable profile-Gyons theorem.

References

1. N. Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill Publishing Co. Ltd, New Dehi.
2. S K Mallick, A P Gupta, Prestressed concrete, Oxford and IBI Series.
3. R. H. Evans, Bennet E W, Prestressed concrete theory and design, Chapman and Hall, London.
4. T. Y. Lin, Design of Prestressed Concrete Structures, Asia Publishing House.

GROUND IMPROVEMENT TECHNIQUES (ELECTIVE - I)

C706-4 **3+1+0**

Module 1

Necessity of soil improvement-selection of improvement method- mechanical stabilization-effect on engineering properties-dewatering-well-point system-electro osmosis-pre-loading- sand drains- methods of installation-vibro-flotation-stone columns.

Module 2

Chemical stabilization- cement stabilization- factors affecting soil cement mixing-admixtures- lime stabilization-effect of lime on soil properties-construction of lime stabilized bases-bituminous stabilization- thermal stabilization- electrical stabilization.

Module 3

Introduction to grouts and grouting- basic functions – groutability ratio – classification of grouts-properties of grouts- fluidity, bleeding potential, rigidity and thixotropy, strength and permeance- grouting applications-seepage control in soil under dams and for cut off walls- seepage control in rock under dams-stabilization grouting for under pinning.

Module 4

Earth Reinforcement- mechanism and concept- stress strain relationship of reinforced soil-design theories and stability analysis of retaining wall-tie back analysis-coherent gravity analysis- application areas of earth reinforcement

Module 5

Geotextiles: Soil reinforcement with geotextiles- classification- concepts-geotextiles as separators, filters, and drainage media-damage and durability of geotextiles

References

1. M.J.Tholinson - Foundation design and construction Robert M.Koerner - Construction and Geotechnical methods in Foundation Engineering
2. C.J.F.P.Jones - Earth Reinforcement and Soil structures
3. R.A.Jewell - Soil Reinforcement with Geotextiles
4. Donald P.Coduto - Geotechnical Engineering, Principles and Practices Prentice Hall India

CONCRETE TECHNOLOGY (ELECTIVE - I)

C706-5 **3+1+0**

Module 1

Concrete materials: cement manufacture - chemical composition hydration - types of cement- tests for cement - setting and hardening - Aggregates - Classification - requirements - size - shape - texture - Tests for aggregates - Alkali aggregate reaction - grading of aggregate - sieve analysis - Flakiness index - Elongation Index Impact value-abrasion value -Water - general requirements - quality of water.

Module 2

Fresh Concrete: Workability - factors affecting - measurement of workability - different tests for workability - segregation - bleeding - process of manufacture of concrete - Batching - mixing - transportation - compaction - curing of concrete - curing methods - admixtures in concrete - air entraining agents - Accelerators – Retarders -workability agents - Damp proofing agents - Miscellaneous admixtures - quality control.

Module 3

Elastic properties of Concrete - factors affecting modulus of elasticity - Strength of concrete: w/c ratio - gel/space ratio - Gain of strength with age. - accelerated curing tests - maturity concept of concrete - effect of maximum size of aggregate on strength - relation between compressive and tensile strength - revibration - high speed slurry mixing - creep - shrinkage - factors affecting.

Module 4

Durability of concrete: - sulphate attack - methods of controlling sulphate attack. Durability of concrete in sea water - action of organic acids, mineral oils, sugar etc. on hard concrete - thermal properties of concrete - Fire resistance cracks in concrete–Remedies, Testing of Hardened concrete, flexural strength - comparison of cuube test and cylinder test - Indirect tension test methods -concrete mix design - IS methods - ACI methods - mean strength - characteristic compressive strength - Non distructive testing of concrete.

Module 5

Special aggregates: light weight - artificial - natural - special concrete - no - fine concrete- high density concrete - Sulphur infilterated concrete - fibre reinforced concrete - polymer concrete polymer impregnated concrete - polymer cement concrete - properties of polymer concrete - special concreting methods - cold Weather concreting, hot weather concreting - Ferrocement.

References

1. Krishna Raju N, Concrete Technology
2. A.M. Neville, Properties of concrete
3. M.S. Shetty, Concrete Technology

TRAFFIC ENGINEERING AND MANAGEMENT (ELECTIVE-I)

C706-6 **3+1+0**

Module 1

Traffic management - scope of traffic management measures - restrictions to turning movements - one way streets - tidal flow operation - regulation of traffic - Need and scope of traffic regulations- Motor Vechicle Act - Speed limit at different locations- regualtion of the vechicle - regulations concerning the driver rules of the road enforcement.

Module 2

Highway capacity: Its importance in transportation studies - basic, possible and practical capacity - determination of theoretical maximum capacity -passenger car units - level of service - concept in HC manual - factors affecting level of service.

Module 3

Design of Intersection: Design of at grade & grade seperated intersection - rotary intersection - capacity of rotary intersection - traffic signals - design of fixed timesignal - pretimed signalised intersection - performance - Websters approach for the design.

Module 4

Traffic Safety: causes of road accidents - collection of accident data - influence of road, the vehicle .the driver, the weather and other factors on road accident - preventive measures.

Module 5

Traffic Flow: theory of traffic flow - scope - definition and basic diagrams of traffic flow- basic concepts of light hill - Whitham's theory - Car 'following theory and queuing

References

1. Khadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers
2. Khanna O.P and Jesto C.G; Highway Engineering, Nem Chand Publishers
3. Martin, Whol, Traffic system Analysis for Engineers
4. Donald Drew, Traffic Flow Theory

OBJECT ORIENTED PROGRAMMING (ELECTIVE - I)

C706-7 **3+1+0**

Module 1

Introduction to OOP: Basic concepts objects-classes-data abstraction-inheritance-polymorphism-dynamic binding-virtual functions-advantages of OPP over procedure oriented programming-object oriented languages. Introduction to C++ - C++ character set - C++ tokens-data types constants and variables - declaration of variables - operators, expression, and statements-type compatibility - type casting- l/O operators <<and >>) cascading of 1/0 operators.

Module 2

Control flow and iterative statements standard input-output streams arrays: one dimension array-multidimensional array- array Initialization. Structures: definition-referencing structure elements. Function prototypes-argument data types-returning values and their types – scope - rules of functions and variables – built - in functions.

Module 3

Classes and Objects: Class declaration - data member functions private and public members class function definition member function definition - private and public member functions methods - creating objects - accessing class data members-accessing member functions - constructors and destructors – declaration, definition and use.

Module 4

Advanced features: Dynamic memory allocation-pointers –new and delete operators-pointer variables- pointers to objects-accessing member functions-classes with pointers to objects- accessing member functions - classes with pointers-copy constructor-static members-friend classes-friend functions-operator overloading File handling in C++: File pointers F-stream classes open (), close () read (), write () functions-detecting end of file.

Module 5

Polymorphism and Inheritance: Function overloading-base class derived class-class conversion-visibility modes-private, public and protected members-single inheritance -privately derived and publicly derived - making protected member inheritable - access control-virtual functions-dynamic binding- abstract classes-concept of multiple inheritance.

References

1. Stanely, Lipman, C++ primer
2. Balaguruswammy, Object Oriented Programming with C++, Tata Mc Graw Hill
3. Robert Lafore, Turbo C++
4. Gordenkeith, Data Abstraction and OOP in C++
5. Strostraup, C++ Programming Language
6. David Parsons, Object Oriented Programming with C++, B P B Publications
7. Y.Kanetkar, Let Us C++, BPB Publications.

OPEN CHANNEL AND COASTAL HYDRAULICS (ELECTIVE - 1)

C706-8 3+1+0

Module 1

Parameters of open channel flow - uniform and non uniform flow normal depth - conveyance - friction formula - specific energy - specific force - diagram - critical depth - application to problems. Critical flow computation - section factor - hydraulic exponent for critical flow computation and its use for trapezoidal channel.

Module 2

Hydraulic jump - sequent depths - dimensionless equation of the jump - loss of head - the jump at the feet of a spillway - criteria for the formation of a jump - use of jump as an energy disspiator. Control of jump by sills - stilling basins.

Module 3

Non-uniform flow - friction slope - differential equation of non-uniform flow - the 12 type of surface profiles - the point of control - computation by Bresse's method and the simplified step method.

Module 4

Water waves - classification into periodic progressive, periodic oscillatory, oscillatory and stationary waves - ocean waves - wave period - wave length and celerity. General expression for the celerity of deep Water - gravity wave and shallow water gravity wave - determination of the wave length and celerity for any water depth given the deep water wave amount as wave energy (no proof). Wave deformation - transformation of waves on a slope (description only) reflection of waves at a vertical sea wall. Clapotis - wave refraction - breaking of waves (description only).

Module 5

Wind generated waves - wave forecasting - significant wave height - breakwaters - different types. Coastal erosion with special reference to the Kerala Coast - shore protection measures - sea walls - tetrapods. groynes and'beach nourishment.

References

1. 1.S.M.Woodword, C.J.Posey, Hydraulic of Steady Flow in Open Channels
2. F. N. Henderson, Open Channel Flow
3. A. I. Ippen, Estuary and Coast line Hydrodynamics
4. K. E. R. I. Peechi, Coastal Engineering Publications
5. V. T. Chow, Open Channel hydraulics, Mc Graw Hill
6. Robert .M. Sorensen, Basic coastal engineering, John Willy & Sons

AIR POLLUTION CONTROL (ELECTIVE - 1)

C 706-9 **3+1+0**

Module 1

Introduction - Significance of air pollution studies, factors that contribute to air pollution - possibilities to air pollution abatemant - air pollution legislation - Techno - administrative aspects of air pollution - Emission and noise standards of Kerala State Pollution Control board.

Module 2

Gaseous pollutants-source, chemistry, adverse effects on plants, animals and human beings, properties - tolerance levels - carbon monoxide, carbon dioxide,

aldehydes, hydrocarbons - compounds of sulphur, compounds of Nitrogen, Oxidants, Hydrogen fluoride - Control of gaseous pollutants - Automobile pollution control.

Module 3

Particulates in the air - source, nature and adverse effects - control of particulates - settling, filtration, collection in fluids, electrostatic precipitation, conversion to harmless and useful products. Meteorology related to atmosphere - pressure, temperature, lapse rates - humidity - condensation - wind direction and velocity. Effects of meteorological parameters on transport and diffussion. Atmospheric Electricity.

Module 4

Optics of the atmosphere - Effects of air pollutants on atmospheric visibility - methods of measurement of visibility - Introduction to noise pollution. Photochemical reactions of the atmosphere.

Module 5

Purpose and principles of measurement of (1) High volume sampler (2) Exhaust gas analyser (petrol and diesel) (3) Stack sampler (4) Sound level meter - industrial hygiene and in plant safety to workers.

References

1. Henry C Perkins, Air pollution, Mc Graw Hill Pvt Ltd, NewDelhi.

Arthur C Stern, Air pollution, Vol I, II, III, IV, V, Academic Press, NewYork.

3. Noel De Nevers, Air pollution control Engineering, Mc Graw Hill International Edition, Mc Graw Hill Inc, New Delhi.

4. M. N. Rao, H V N Rao, Air pollution, Tata Mc Graw Hill Pvt Ltd, NewDelhi.

REMOTE SENSING AND ITS APPLICATIONS (ELECTIVE - I)

C706-10 **3+1+0**

Module 1

Principles and concepts: Introduction and definition of remote sensing terminology- principles and methods of remote sensing- electro-magnetic radiation and spectrum- radiation sources-interference- atmospheric effects on remote sensing- atmospheric window –energy interaction with surface features- different types of platforms- sensors and their characteristics-orbital parameters of a satellite- multi concepts in remote sensing.

Module 2

Aerial photogrammetry: Definition- types of photographs- geometry of photographs – parallax - pair of photographs- height determination- flight planning stereoscopy.

Module 3

Interpretation of images: Aerial photo interpretation – basic elements- techniques of photo interpretation- application of aerial photo interpretation- photographs versus maps- interpretation of satellite images- ground truth collection and interpretation and verification- advantages of multi date and multi band images.

Module 4

Imagery: Landsat imagery- thermal infrared imagery- Radar imagery- digital image processing- comparison with image types- applications of satellite imagery- merits- limitations-comparison with aerial photographs.

Module 5

Applications: Applications in water resources management- land use mapping and monitoring- soil sciences- geology- agriculture- forestry - oceanography.

References

1. Thomas M. Lillesand & Raiph W. Kiefer, “Remote sensing and image interpretation”, John Wiley Sons.
2. Floyd F. Sabins, “Remote sensing principles and interpretation”, Freeman and company.
3. Campbell J. B, “Introduction to remote sensing”, The Guilford press, London.
4. Curran P.J., “Principles of remote sensing”, Longman, London.
5. Engmen E.T and Gurnay R. J.,”Remote sensing in hydrology”, Chapman and Hall.
6. Wolf P.R., “Elements of photogrammetry”, McGraw Hills.

TRANSPORTATION ENGINEERING LAB

C707 **0+0+3**

TEST ON SOIL

1.Califormia bearing ratio method.

TEST ON BITUMEN

2. Softeningpoint of Bitumen
3. Ductility test on Bitumen
4. Specific gravity of Bitumen
5. Flash and fire point test
6. Stripping value test
7. Viscosity using Viscometer

TESTS ON ROAD AGGREGATES

8. Aggregate crushing value test
9. Impact value test
10. Specific gravity test
11. Shape tests - Flakiness index and elongation index
12. Los angles abrasion test
13. Bulk density, specific gravity, void ratio and porosity of coarse aggregate, water absorbtion.

TESTS ON MIXES

14. Marshell stability value
15. Determination of bitumen content by bitumen extractor.

COMPUTER AIDED DESIGN II

C708 **0+0+3**

Module I and II

- **INTRODUCTION**
  Overview and the Environment of STAAD-III Package.
- GENERAL DESCRIPTION
  Type of structure, Unit systems, structure geometry and Co-ordinate systems, global co- ordinate system, Local co-ordinate systems
- STAAD III Commands- Using Edit Input-Command Formats-Text Input.
- STAAD PRE- Graphical Input Generation-"Concurrent" Verifications-
  Library- Geometry Generation – Dimensioning.

- STAAD POST – Graphical Post Processing – Animation – Icons – Isometric View – Zooming-Results of Analysis & Design – Query reports.
- LOAD – Member Load, Element Load, Joint Load, Floor Load, Self weight Command, Load case no, Load Combination .Load Generation for Wind Load, Seismic Load and Moving Load
- FINITE ELEMENT ANALYSIS & Dynamic Analysis.
- DESIGN for Concrete and Steel Structures using IS: 456 and IS 800 respectively.
- STAAD INTDES – Interactive Design Series for slabs, retaining walls and footings.

Note

The student has to practice the above topics by working out problems in

1. Analysis and design of steel trusses, Steel and RCC framed structures.
2. Analysis and design of multi-storied framed structures.
3. Analysis and design of RCC and steel water tanks.

Module III & IV

Project management using CPM/PERT Software
(Microsoft Project /PRIMAVERA software)

1. Practice on the GUI of the software and Input of Date
2. Practice on Creating Bar Charts/Ghant charts
3. Practice on creating CPM/PERT charts and finding out critical path.
4. Practice on resource allocation and leveling of resources.
5. Practice on Project Monitoring (Cost &Time)
6. Plotting and printing of various charts and project

Note

The student has to practice the above topics by doing Project Management for Turn key projects related to Civil Engineering applications.

References

1. STAAD III Reference Manual
2. MS Project/PRIMAVERA Reference Manual

8TH SEMESTER

Course Code	Subject Code	Subject	Marks			
			Sessional	Theory	Practical	Total
A	C801	Advanced structural design	50	100	-	150
B	C802	Finite Element Analysis	50	100	-	150
C	C803	Building Technology and Management	50	100	-	150
D	C804	Environmental Engineering II	50	100	-	150
E	C805	Elective –II	50	100	-	150
F	C806	Elective –III	50	100	-	150
G	C807	Environmental Engineering Laboratory	50	-	100	150
H	C808	Project / Seminar	100	-		100
I	C809	Viva - Voce			50	50
Total			450	600	150	1200

ADVANCED STRUCTURAL DESIGN

C801 **2+2+0**

Module 1

Road bridges: I. R. C. Specifications - slab bridges -T-Beam bridges - box culvert - bearings.

Module 2

Shell structures: General principles for membrane theory for symmetrical uniformly distributed load - design of a simply supported single barrel cylindrical shell for membrane stresses - beam method. Folded plates: general principles - structural behaviour of plates (design not required)

Module 3

Industrial buildings: roof loads - analysis and design of trusses - design of purlins - design of bracing – supporting system.

Module 4

Design of plate girders and gantry girders - riveted and welded compound sections.

Module 5

Steel bridges: - I. S. Specifications - design of highway and railway bridges of plate girder type.

References

1. I. R. C. Bridge code, Indian Railway Bridge code, I. S. 456, I. S
2. Victor J.D., Design of Concrete Bridges, Oxford& I B H Publishing Company, New Delhi.

3. Krishna Raju, Advanced Design of Concrete Structures, Oxford& I B H Publishing Company, New Delhi.
4. Ramchandra, Design of Steel Structures. Vol II, Standard Book House, Delhi.
5. Ramaswamy G.S., Design and Construction of Concrete Shell Roofs, Mc Graw Hills

FINITE ELEMENT ANALYSIS

C802

3+1+0

Module 1

Introduction to FEM-Historical development-Idealization of actual structures-Mathematical model-General procedure of FEA-Displacement approach. Solution techniques- Gauss Elimination – Frontal solver (concepts only)

Module 2

Finite element analysis- -Energy principles- Principle of Stationary Potential Energy- Complementary Energy - Variational approach -Stable- Unstable-Neutral equilibrium-Virtual work- Principle of virtual forces – Principle of virtual displacements.

Module 3

Shape functions-Lagrangian and Hermition Interpolation – Polynomials – General coordinates-Area coordinates-Compatibility –C_0 and C_1 elements-convergence criteria- conforming & nonconforming elements – Patch test

Module 4

Stiffness matrix-Bar element-Beam element-Triangular elements - Constant Strain Triangle-Linear Strain Triangle- Isoparametric elements-Numerical Integration - Gauss Quadrature.

Module 5

General plate bending elements- Plate bending theory – Kirchhoff's theory – Mindlin's theory – Introduction to locking problems- preventive measures – reduced integration – selective integration. Axysymmetric elements- Introduction to shell elements

References

1. O C Zienkiewicz,.Finite Element Method, fourth Edition,McGraw Hill,

2. R.D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley &Sons.
3. Stephen P.Timoshenko& Krieger, S.W., Theory of Plates and Shells, McGraw Hill.
4. C.S.Krishnamoorthy, Finite Element Analysis, Tata McGraw Hill .New Delhi, 1987.
5. S.Rajasekharan, Finite Element Analysis, Wheeler Publishing Co., &Sons.1993.
6. T.Kant, Finite Element Methods in Computational Mechanics, Pergamons Press.
7. K.J.Bathe, Finite Element Procedures in Engineering Analysis, Prentice Hall,
8. Mukhopadhyay M., Matrix Finite Element Computer and Structural Analysis, Oxford &IBH, 1984.
9. Irving H.Shames, Energy &Finite Element Methods in Structural Mechanics.
10. Desai C.S.&Abel J.F., Introduction to Finite Element Methods, East West Press.

BUILDING TECHNOLOGY AND MANAGEMENT

C803 **3+1+0**

Module 1

Concrete Mix Design: General concepts. BIS method of mix design, American standards of mix design, IS-method of mix design, Durability concepts in mix design - Requirements and tests of materials required for mix design.-Fibre reinforced concrete- High performance concrete.

Form work. General arrangements – general requirements – common faults – materials for form work – form work arrangements – form work design – loads on forms – design procedure – form work vibration for compaction of concrete – stripping time and shoring.

Module 2

Prefabricated construction: *Advantages, foundation units, wall panels, frames for opening, walls–units for roofs and floors – low cost roof systems. Hollow concrete blocks, Ferro cement – use and application – modular co-ordination – method of production – flow line method – station method – manufacturing process for structural units.*

Codification and Standerdisation- Value analysis: *Various methods and techniques.*

Module 3

Construction company organization: Different types of organizational set up – construction team – objectives of civil engineering management – duties and responsibilities of a civil engineer – functions of construction management. Technical planning.

Site organization: *Organization of labour, resources, materials, method of execution of the project – inspection and quality control- safety in construction.*

Module 4

Materials Management: *Functions of materials management – inventory control techniques.*

Construction contracts: *Item rate contract – Lump-sum contract – Labour contract – Negotiated contract – Global contract – Percentage contract – Cost plus percentage contract- Cost plus fixed fee contract- Cost plus fluctuating fee contract – Target contract – All in contract.*

Module 5

Claims manual for a construction organization: *Law of contract - Extra work and deviation order – claims – owner's claim – sub contractor's claim – disputes and arbitration – consequences of mistake in contracts – terms and conditions of contract – contract documents – earnest money – security deposit – warranty period – contract signed under coercion – contract signed by minors, insane or drunken persons – authority to agree and find, validity of an oral agreement – conditions and warranties – express terms and implied terms – voidable contracts and their performance – illegal and voidable contracts – liability for tort in contract- litigation – breach of contract and remedies – discharge of contract – equity, privity of contract – transfer of contractual rights and obligations.*

References

1. M .S Shetty, concrete technology, S. Chand & Co.
2. S. P Arora, Building constructions, Dhanpat Rai & sons, New Delhi.
3. B. L Gupta, Amit Gupta, Construction Management and accounts, standard publishers and Distributions.
4. Construction Management and accounts – V .N Vazirani.
5. National Building code of India – Indian standards.
6. Construction Engineering & Management, S. Seetharaman, Umesh
7. Publications, Delhi.

ENVIRONMENTAL ENGINEERING - II

C804 **3+1+0**

Module 1

Introduction**:** Storage of water - effect of storage on quality of water, general layout of treatment plant - surface water and ground water. Aeration, purpose of aeration. Sedimentation - plain sedimentation, theory of sedimentation, continuous flow sedimentation tanks. Chemically aided sedimentation - necessity, theory of coagulation and flocculation - generally used coagulants, dosage, feeding, mixing devices, clariflocculators, design of flash mixers clarifiers and clarifloculators.

Module 2

Filtration **-** Theory of filtration, filter media - sand for filtration. Classification of filters - design, construction, control, operation and maintenance of rapid sand filters and slow sand filters. pressure filters, dual media & multimedia filters.Disinfection: requirements of a good disinfectant, chlorination - action, application, and dosage chlorine demand, pre chlorination, post chlorination, double chlorination, super chlorination, breakpoint chlorination, chloramination. Other disinfectants. Miscellaneous treatment methods: color, odour and taste removal, iron and manganese removal, deflouridation, removal of hardness, desalination.

Module 3

Introduction: Objectives of waste water treatment - Effluent standards, KSPCB Standards, BIS Standards. Layout of conventional treatment plant - preliminary, primary, secondary and tertiary treatments in general. Preliminary process: screens - types of screens, design, disposal of' screenings; comminutors, grit chamber - function, design, construction and operation, disposal of grit , detritus tank, skimming tank -function, design and operation, disposal of skimmings Sedimentation: Theory of sewage sedimentation - design, construction and operation, rectangular and circular tanks, disposal of sludge.

Module 4

Biological process: principle and theory of biological treatment**.** Sewage filtration: Trickling filters - design, construction and operation. Activated sludge process: Design, construction and operation of conventional and extended aeration, aeration methods. Miscellaneous methods- Stabilization ponds, Oxidation ditch, Aerated lagoons, rotating biological contactors; disinfection of sewage effluents.

Module 5

Sludge treatment and disposal: quantity of sludge, characteristics of sludge, sludge thickening, digestion, conditioning and disposal, design of sludge digesters only. Septic Tanks: Design (as per Ministry of urban development) construction, disposal of effluents, cleaning of tanks, Imhoff tanks.

Sewage treatment by high rate anaerobic methods: Anaerobic digestion, suspended growth, contact process, UASB, attached growth, filters, expanded bed - only basics (Ref. Wastewater Engineering by Metcalf and Eddy - 3rd Edn.)

References

1. Peavy, Rowe, Tchobanoglous, Environmental Engineering, Mc Graw Hill International Editions.
2. S. K. Garg, Environmental Engineering Vol. l & ll, Khanna Publishers, New Delhi.
3. B.C. Punmia, Water supply Engineering, Arihant Publications, Jodpur.
4. B.C. Punmia, Waste water Engineering, Arihant Publications, Jodpur.
5. Metcalf & Eddy, Waste water Engg. 3rd Edn., Mc Graw Hill International Editions.
6. Mark J Hammer, Water and waste water technology, John Wiley and sons, Inc.

ADVANCED MATHEMATICS (ELECTIVE - II)

CMELRT 805-1 **3+1+0**

Module 1 Green's Function

Heavisides, unit step function – Derivative of unit step function – Dirac delta function – properties of delta function – Derivatives of delta function – testing functions – symbolic function – symbolic derivatives – inverse of differential operator – Green's function – initial value problems – boundary value problems – simple cases only

Module 2 Integral Equations

Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green's function – solution of Fredhlom integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

Module 3 Gamma, Beta functions

Gamma function, Beta function – Relation between them – their transformations – use of them in the evaluation certain integrals – Dirichlet's integral – Liouville's extension of Dirichlet's theorem – Elliptic integral – Error function.

Module 4 Power Series solution of differential equation

The power series method – Legendre's Equation – Legendre's polynomial – Rodrigues formula – generating function – Bessel's equation – Bessel's function of the first kind – Orthogonality of Legendre's Polynomials and Bessel's functions.

Module 5 Numerical solution of partial differential equations.

Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson's equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.

References

1. Ram P.Kanwal, Linear Integral Equation, Academic Press, New York.
2. Allen C.Pipkin, Springer, A Course on Integral Equations, Verlag.
3. H.K.Dass, Advanced Engg. Mathematics, S.Chand.
4. Michael D.Greenberge, Advanced Engg. Mathematics, Pearson Edn. Asia.
5. B.S.Grewal, Numrical methods in Engg.&science, Khanna Publishers.
6. R.F. Hoskins, Generalized functions, John Wiley and Sons.
7. Bernard Friedman, Principles and Techniques of Applied Mathematics, John Wiley and sons
8. James P.Keener, Principles of Applied Mathematics, Addison Wesley.
9. P.Kandasamy, K.Thilagavathy, K.Gunavathy Numerical methods, S.Chand & co.

THEORY OF SHELLS (ELECTIVE - II)

C805-2 **3+1+0**

Module 1

Structural behaviour of shells-classification of shells-translational and rotational shells-ruled surfaces-methods of generating the surface of different shells-hyperbolic paraboloid-elliptic paraboloid-conoid-Gaussian curvature-synclastic and anticlastic surfaces.

Module 2

Classical theories of shells-thin shell-thick shell-small deflection theory-stress resultants and deformations of shells without bending.

Module 3

Cylindrical shells-membrane theory of cylindrical shells-free body diagram of a cylindrical shell element-formulation of equilibrium equation.

Module 4

Bending theory of cylindrical shells-stresses and deformation of circular cylindrical shells-pressure vessels-cylindrical shells with uniform internal pressure-free body diagram of a differential cylindrical shell element- formulation of equilibrium equation.

Module 5

Finite element application on cylindrical shells-introduction to shell elements-flat elements-axisymmetric elements- degenerated elements-general shell element.

References

1. Timoshenko, W Krieger, Theory of plates and shells, Mc Graw Hill.
2. Gol'oenveizen, Theory of elastic thin shells, Pergaman Press, 1961.
3. J Ramachandran, Thin shells theory and problems, Universities press.
4. Novoshilov V V,Theory of thin elastic shells, P Noordoff, Groningen,1959.
5. Baker E H, Kovalesky and Flrish, Structural analysis of shells, Mc Graw Hill, New York.
6. Kraus H, Thin elastic shells, Wiley, New York, 1967.
7. Ramaswamy G S, Design and construction of concrete shell roofs, Mc Graw Hill, New York.
8. Wilhelm Flugge, Stresses in shells, Springs, Verlog, Berlin.

ADVANCED STEEL STRUCTURES (ELECTIVE - II)

C805-3 **3+1+0**

Module 1

Microwave and Transmission Towers: Introduction - Loads - Analysis of Microwave & Transmission towers - Design of members - Design of foundation - Design of Connections - Application using STAAD, SAP.

Module 2

Pre-Engineered Metal Buildings: Introduction - Loads - Metal cladding - Design of cold formed secondary framing - Optimization design of main frames - Wind bracing - Frame connections (haunch, ridge) - Column base connections (fixed, pinned) - Application using STAAD, STRAP.

Module 3

Multi-storey Buildings: Introduction - Anatomy of structure - Loads - Design of columns - Design of composite beams - Design of composite floor - Bracings – Connections - Application using STAAD, STRAP.

Module 4

Space Frames: Introduction - Structural types - Loads - Design of single layer barrel vault - Design of single layer dome - Design of double layer flat - Design of node connectors - Application using STAAD, SAP.

Module 5

Construction: Tolerances: Fabrication tolerances - Erection tolerances, Fabrication: Economy - Shop activities - Quality management, Erection: Method statement - programme – Machineries, Fire Protection: Regulations - Structural performance - Methods of protection, Corrosion Resistance: Corrosion process - Effect of environment - Protection methods.

References

1. Ram Chandra, Design of Steel Structures, Vol. II, Standard Book House, New Delhi.
2. Alexander Newman, Metal Building Systems: Design and Specifications,
3. Graham W. Owens, Peter R. Knowles, Steel Designers Manual, Blackwell Scientific Publications, Oxford, ISBN 0-632-03881-0.
4. Ramamrutham S., Design of Steel Structures, Dhanpat Rai Publishing Co., New Delhi, 2001, ISBN 81-87433-36-1.
5. Ramaswamy G. S., Suresh G. R., Analysis, Design and Construction of Steel Space frames, Thomas Telford Ltd., 2002, ISBN 0-7277-30142.
6. Edwin H. Gaylord, Jr., Charles N. Gaylord, Design of Steel Structures, McGraw-Hill, Inc., Singapore, ISBN 0-07-112623-6.

7. IS: 800 - 1984, Use of Structural Steel in General Building Construction, BIS, New Delhi.
8. IS: 802, Use of Structural Steel in Overhead Transmission Line Towers, BIS, New Delhi.
9. IS: 875 - 1987, Code of practice for Design Loads (Parts I, II & III), BIS, New Delhi.
10. IS: 806, Code of practice for use of Steel Tubes in General Building Construction, BIS, New Delhi.
11. IS: 1161, Specification for Steel Tubes for Structural Purposes, BIS, New Delhi.

HIGHWAY AND AIRFIELD PAVEMENTS (ELECTIVE - II)

C805-4 **3+1+0**

Module 1

Pavement types: stress distribution in pavements - theoretical subgrade conditions and traffic loadings Basic difference between flexible and rigid pavements - design factors - wheel load - equivalent single wheel load - repetition of loads - elastic modulii - climatic variations.

Module 2

Design of flexible pavements: group index method - CBR method - IRC recommendations - Me Load method - Burmister's layer theory.

Module 3

Design of rigid pavements: radius of relative stiffness - critical load positions - Westergaard's stress equation - Bradley's stress coefficients - design charts.

Module 4

Temperature stresses in concrete pavements: Westergaard's concept - wrapping stress - functional stress - combination of stresses.

Design of joints in concrete pavements: expansion joints - construction joints - design of dowel bars - tie bars - IRC recommendation.

Module 5

Evaluation of pavement condition: pavement instrumentation - types of pavement distress - roughness and skid resistance. Environmental influence and effects- pavements maintenance and overlays.

References

1. Bindra B.S, Highway Engineering, Danpat Rai and Sons.
2. H.J.Yoder, Principles of Pavement Design, John wiley and sons
3. Khanna O.P, Justo C.G., Highway Engineering, Nem Chand Publishers
4. IRC Standard specifications for Construction of Flexible and rigid pavements

ADVANCED FOUNDATION DESIGN (ELECTIVE - II)

C805-5 **3+1+0**

Module 1

Machine foundations: basic theory of vibrations-free and forced vibration of single degree of freedom with and without damping-two degrees of freedom with and without damping-dynamic soil properties-mass spring model and constants-elastic half space approach-determination of dynamic soil constants in laboratory and field based on IS code provisions. Modes of vibration of block foundation – natural frequency of foundation of soil system by Barkan's approach-methods of analysis-Barkan's method. Vertical translations, sliding, rocking, yawing (IS code method)

Module 2

Design of machine foundations: Static and dynamic design criteria-permissible amplitude of vibrations for different types of machines. Foundations for reciprocating machines- design criteria- calculation of induced forces and moments- multi cylinder engines-Foundations subjected to impact type of forces (hammer)-design data-design criteria-vibration isolation.

Module 3

Sheet Pile walls and Cofferdams: types and uses of sheet piles-design of cantilever sheet pile walls in granular and cohesive soils-anchored bulkhead-free earth support and fixed earth support method-coffer dams-uses- braced and cellular cofferdams.

Module 4

Special Foundations: Foundation for special structures such as water tanks, silos, cooling towers, guyed structures, ground storage tanks, chimneys, telecommunication towers, transmission line towers-foundation for under ground conduits- foundation for coastal and offshore structures-pre-stressed foundations. Shell Foundations-structural form and efficiency-different types.

Module 5

Foundations in Special soils: Foundation in expansive soil, soft and compressible soils, problems associated with foundation installation- ground water lowering and drainage- shoring and underpinning-different methods-damage and vibrations due to constructional operations

References

1. Bowles.J.E, Foundation Analysis and DesignMc Graw Hill Publishing Company.
2. N.P.Kurian, Modern foundations Tata Mc Graw Hill Publishing company
3. Srinivasulu P, Vaidyanathan C.V Handbook of Machine foundations

4. IS 2974-part I toV.
5. IS 5249

INDUSTRIAL WASTE ENGINEERING (ELECTIVE - II)

C805-6 **3+1+0**

Module 1

Introduction: Environmental pollution - Magnitude of the industrial waste problem in India - damage caused by industrial waste pollution. Effect of industrial wastes on streams and sewerage systems**:** Computation of organic waste loads on streams - Streeter phelps, Churchill and Thomas methods.

Module 2

Stream sampling**:** stream protection measures - effluent and stream standards. Characteristics of industrial wastes**:** physical, chemical and biological. retreatment of industrial wastes**:** waste volume reduction, waste strength reduction - neutralization, equalization and proportioning.

Module 3

Theories of treatments processes**:** removal of suspended solids by sedimentation and flotation, removal of colloidal solids by coagulation - removal of inorganic solids by evaporation & ion exchange. Removal of organic solids**:** lagooning, activated sludge treatment - extended aeration, step aeration, trickling filters. High rate anaerobic treatment - up flow and down flow filters; up flow anaerobic sludge blanket reactor - Disposal of sludge solids. Joint treatment of treated and untreated wastes with domestic sewage - discharge of raw and treated wastes to streams.

Module 4

Major industrial Wastes and their treatment**:** pulp and paper industry - oil refinery - textile industry - tannery.

Module 5

Treatment of industrial waste: canning - dairy - sugar - distillery.

References

1. M Narayana Rao, Waste water treatment, Rational methods of design and Industrial practice, Oxford & IBH Publishing Co. Pvt. Ltd, Bombay.
2. Nelson Leonard Nemerow, Theories and practices of industrial waste treatment, Addison-Wesley Publishing Co., Inc.

3. C Fred Gurnham, Principles of industrial waste treatment, John Wiley & Sons, Inc., New York.
4. W Wesley Eckenfelder Jr., Industrial water pollution control, International Edition, Mc Graw Hill Inc, New Delhi.
5. Hardam Singh, Industrial Waste water management Hand Book, Mc Graw Hill, NewDelhi.

ADVANCED HYDROLOGY (ELECTIVE - II)

C805-7 **3+1+0**

Module 1

Introduction: Hydrologic cycle-history of hydrology - application in engineering: water resources in the world - water resources in India. Weather and hydrology: Thermal circulation - effects of earth's rotation - effect of' land and water distribution - migratory systems - fronts - measurement of temperatures - Lapse rate of temperatures - geographic distribution of temperatures - time variations of temperatures - properties of water vapour- Measurement of humidity - geographic distributions of humidity - time variations in humidity-geographic variations of wind - time variations of wind - scanning and predicting weather.

Module 2

Precipitation: types of precipitation - measurement of precipitation recording gauges - automatic gauges radars -estimation of missing data and adjustment of records - mean areal depth of precipitation -rain gauge network- design principles-depth area duration curves - Hectograph and mass curve of rainfall - analysis of rainfall data - moving average curves - design storms - probable maximum precipitation curves snowfall and measurement. Determination of snowmelt. Water Losses:.Evaporation-evaporation pans – evapometre, control of' reservoir evaporation - soil evaporation - transpiration - estimation of evapo transpiration - infiltration - infiltration curves - determination of infiltration-irifiltration indices - water shed leakage - water balance.

Module 3

Runoff: Catchment characteristics - classification of streams - factors affecting-run off, run off estimation by empirical formulae, curves infiltration method, rational method, overland flow hydrograph and unit hydrograph, method. Hydrographs**:** Separation of stream, flow components - hydrograph separation - unit hydrograph - assumption - derivations of unit hydrograph - unit hydrograph of complex storms - instantaneous unit hydrograph - synthetic unit hydrograph. .

Module 4

Floods: Definition of standard project flood - maximum probable flood - probable maximum precipitation and design flood - estimation of peak flood-flood control.

Measures - flood forecasting techniques- flood routing - analytical and graphical methods of flood routing. Sedimentation: The erosion process - factors controlling erosion - suspended load, bed load - estimation of sediment load (basic principles and statement of important.equations only) measurement of sediment load - reservoir sedimentation - control of reservoir sedimentation.

Module 5

Probability analysis of hydrological data**:** mean, median, mode, mean-deviation, standard deviation, variances and skewness of data normal, gamma, poisons, log normal and pears and type III distributions - flood, frequency by fuller's, Gumbel's, Powel and Ven Te chow methods.

Mathematical models in hydrology**:** definition of stochastic models, deterministic models-conceptual models and empirical models- optimisation of models and efficiency of models - method of determining 1UH by the s-curve hydrograph, convolution integral and conceptual models - synthetic stream flow - flow at ungauged sites - by multiple regression - reservoir mass curve - flood forecasting.

References

1. H. M.Reghunath, Hydrology, Wiley Easten Ltd., New Delhi.
2. Santhosh Kumar Garg, Hydrology and flood control engineering, Khanna Publishers
3. R.K. Linsley, M. A. Kholar, Hydrology for engineers, Tata Mc Graw Hill.

APPLIED GEOLOGY (ELECTIVE - II)

C805-8 **3+1+0**

Module 1

Plate tectonics: Plate tectonics and drift of continents-Pangaea and drift of Indian plate-formation of Himalayas-Tectonic frame work of South India -Tectonic movements-their significance-methods of detecting tectonic movements - radar interferometry & global positioning system.

Earthquake: Earthquakes in relation to plate tectonics-global seismic belts -seismic zones of Inida-seismicity of South India-earthquakes in Kerala -earthquake resistant structures-prediction of earthquake-defusing earthquake-Reservoir induced seismicity.

Module 2

Structural geology: Clinometer & Brunton compass-Measuring of strike and dip using clinometer/Brunton compass-Basic idea of toposheets-Lineaments-

definition-singificance-techniques of identifying lineaments-major lineaments in South India and Kerala.

Remote sensing: Basic concepts-electromagnetic radiation, spectral windows, spectral signatures, sensors, false colour images, geocoded images.
Remotesensing satellites-Landsat.

Aerial photography: Basic concepts-stereopairs, stereoscopic vision, stereoscope-Limitations of aerial photography.

Applications: Interpretation of imageries (brief description only). Application of satellite imageries and aerial photographs in geological and hydrogeological studies.

Module 3

Hydrogeology - General: Groundwater-importance and availability-Aquifers-confined and unconfined-Artesian wells-Geologic formations as aquifer-laterite-sandy layers-weathered rock-fractured crystalline rock- their distribution in Kerala-Structures used for tapping groundwater-Open well, Bore well, Tube well & Filterpoint well (construction techniques not expected). Saline water intrusion.

Module 4

Hydrolgeology - Groundwater exploration techniques: Hydrogeological, geophysical & geobotanical methods-Geophysical method-resistivity survey-Wenner and Schlumberger configurations-interpretation of resistivity curve-curve matching technique.

Groundwater recharge: Natural & artificial. Structures used for artificial recharge-checkdams, subsurface dams, open well & bore well. Selection of site for subsurface dams-salient features.

Module 5

Practical Work: Identification of important rock forming **minerals**: 1.Quartz, 2.Feldspar, 3.Hypersthene, 4.Auguite, 5. Hornblende, 6. Biotite, 7.Muscovite, 8.Olivine, 9.Garnet, 10.Fluorite, 11.Tourmaline, 12.Calcite, 13.Kyanite, 14. Kaolin, 15. Serpentine. Identification of common **rock types**: Igneous rocks: 1. Granite, 2. Syenite, 3. Diorite, 4. Gabbro, 5. Peridotite, 6.Dolerite, 7.Basalt, 8.Pegmatite.Sedimentary rocks: 1.Conglomerate, 2.Breccia, 3.Sandstone, 4.Limestone, 5.shale.Metamorphic rocks: 1. Gneiss, 2. Schist, 3. Slate, 4. Marble, 5. Quartzite, 6. Augen gneiss, 8. Mylonite, 9. Pseudotachyllite.
Special Indian rock types: 1. Charnockite, 2. Khondalite, 3. Laterite.

Recommended Field work: Field trips to learn identification of faults/lineaments in the field and groundwater exploration techniques.

References

1. Arthur Holmes, Physical geology, Thomas Nelson.
2. Arthur D. Howard, Geology in environmental planning, McGraw Hills, New Delhi.

3. M.P.Billings, Strucutural geology, Asia Publishing house, New Delhi.
4. N.W. Gokhale, A manual of problems in structural geology, CBS Publishers & distributors, New Delhi.
5. Thomas M. Lillesand & Raiph W. Kiefer, Remotesensing and image interpretation, John Wiley Sons, New York.
6. K.K.Rampal, Text book of photogrametry, Oxford & IBH Publishing company, New Delhi.
7. David Keith Todd, Groundwater hydrology, John Wiley & sons, New York.
8. H.M. Regunath, Groundwater, Willey Eeastern Ltd.
9. HH.Read, Rutleys elements of mineralogy, George Allen & Unwin Ltd, London.
10. G.W.Tyrell, Principles of petrology, B.I. Publications, Bombay.
11. E.G. Ehler & H. Blatt, Petrology-igneous, sedimentary & metamorphic, CBS Publishers & distributors, Delhi.

STRUCTURAL DYNAMICS AND STABILITY ANALYSIS (ELECTIVE - III)

C806-1 **2+1+0**

Module 1

Introduction-problems in nature-steady state problem-dynamic problem-stability problem (Eigen value problem)-introduction to dynamic loading-D'Alembert's equation of equilibrium-inertia force-effect of damping-Hamilton's principle.

Module 2

Single degree of freedom system-idealisation-free vibration-natural frequency-resonance-forced vibration-lumped mass-consistent mass.
solution techniques-determinant search procedure-Householders method

Module 3

Introduction to stability analysis-energy principles-stable, unstable and neutral equilibrium-fourth order differential equation for generalized bending problems-elastic instability of columns-Euler's theory-assumptions-limitations. General treatment of column stability problem as an Eigen value problem-various modes of failure for various end conditions- both ends hinged-both ends fixed-one end fixed other end free- one end fixed other end hinged

Module 4

Beam column-beam column equation-solution of differential equation for various lateral loads-udl and concentrated loads-solutions for various end conditions-both ends hinged-both ends fixed-one end fixed other end free- one end fixed other end hinged.

Module 5

Finite element application to dynamics-element stiffness matrix and mass matrix of a beam element. Finite element application to stability analysis- finite element

stability analysis-element stiffness matrix –geometric stiffness matrix-derivation of element stiffness matrix and geometric stiffness matrix for a beam element.

References

1. Ray W Clough, Joseph Penzien, Dynamics of structures, Mc Graw Hill, Kogabusha Ltd.
2. Ziegler H, Principles of structural stability, Blarsdell, Wallham, Mass, 1963.
3. Thompson J M, G W Hunt, General stability of elastic stability, Wiley, New York.
4. Timoshenko, Gere, Theory of elastic stability, Mc Graw Hill, New York.
5. Don O Brush, B O O Almorth, Buckling of Bars, plates and shells,
6. Cox H L, The buckling of plates and shells, Macmillam, New York, 1963.
7. O C Zienkiewicz ,.Finite Element Method ,fourth Edition,McGraw Hill,
8. R.D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley &Sons.

INTERNET PROGRAMMING AND JAVA (ELECTIVE - III)

C806-2 **2+1+0**

Module 1

Internet: Definition-principles of internet working-protocols TCP/IP.

E-mail- architecture and services. World wide web- definition- linking of documents in www-URL-DNS. Major categories of websites over Internet. HTML-Tags and writing pages.

Module 2

Importance of Java – advantages - method of byte codes - object oriented programming concepts in Java-data types – variables – arrays – operators - control statements.

Classes: Overloading – inheritance - packages and interfaces - exception handling-built in exceptions.

Module 3

Threads: Multi threading-string handling-an overview of important packages and interfaces used in Java-Java.util, Java.io.

Module 4

Applet: applet class-event handling-overview of event classes.

AWT: working with windows-graphics-text-AWT controls-layout managers-menu-images.

Module 5

Databases-JDBC connectivity- introduction to swing, RMI, servlets, COM, CORBA, Java Beams.

References

1. MK Goel, Internet,
2. Herbert Schildt, Java the complete reference, Tata Mc Graw Hill.
3. Steven Holzner, Java 2 Black book, Wiley Dreamtech
4. Joseph L Weber, Using Java, Prentice Hall India New Delhi.
5. James Gosling, Java Programming.

TRAFFIC AND TRANSPORTATION PLANNING (ELECTIVE - III)

C806-3 **2+1+0**

Module 1

Statistical methods for Traffic Engineering: definition and probability - probability distribution – Poisson, Binomial and normal distribution. Applications in traffic engineering: sampling theory and significance testing - linear regression and correlation - simple problems.

Module 2

Systems approach to transport planning: stages in transport planning - trip generation - introduction and definitions – factors affecting trip generations and attraction - Multiple linear regression analysis - category analysis - Modal split analysis.

Module 3

Trip Distribution: growth factor methods - synthetic methods. Trip Assignment: purpose, general principle - assignment techniques.

Module 4

Parking: Parking problems - desirable parking space standards for different land use -common methods of on- street parking, off-street parking facilities, parking surveys.

Street illumination: Definition of common terms - types and location of lanterns on straight roads and junctions avoiding glare.

Module 5

Transportation Economics: Road user cost-Motor Vehicle operation cost - fixed and variable costs - road user benefits - principles of economics - analysis through annual cost - rate of return and benefit cost ratio methods - worked out problems.

References

1. Khadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers
2. Hutchinson “Principles of Urban transport systems Planning

3. Martin & Whol Traffic system Analysis for Engineers
4. Donald Drew Traffic Flow Theory

ENVIRONMENTAL GEOTECHNICS (ELECTIVE - III)

C806-4 ***2+1+0***

Module 1

Clay mineralogy and soil structure: Gravitational and surface forces-inter sheet and inter layer bonding in the clay minerals- Basic structural units of clay minerals- isomorphous substitution – kaolinite mineral- montmorillonite mineral- illite mineral- electric charges on clay minerals – base exchange capacity- diffused double layer- adsorbed water- soil structure- methods for the identification of minerals (introduction only).

Module 2

Effect of environment on Geotechnical properties of soils: Effect of drying on Atterberg limits.-Volume change behaviour- factors controlling resistance to volume change- general relationship between soil type, pressure and void ratio.- importance of mineralogical composition in soil expansion. Activity- sensitivity- causes of sensitivity-influence of exchangeable cations, pH and organic matter on properties of soils. Permeability of soils- hydraulic conductivity of different types of soils – Darcy's law and its validity- factors affecting permeability

Module 3

Wastes and Contaminants (introduction only): sources of wastes-types of wastes- composition of different wastes- characteristics and classification of hazardous wastes- generation rates- ground water contamination- sources of ground water contamination- transport mechanisms-potential problems in soils due to contaminants.

Module 4

Disposal and containment technics: Criteria for selection of sites for waste disposal- hydrological aspects of selection of waste disposal sites- disposal facilities- subsurface disposal technics-disposal systems for typical wastes (sketches only)

Module 5

Containment control systems- liners and covers for waste disposal- rigid liners- flexible liners. Ground modification technics in waste management – waste modification- ground modification- mechanical modification-hydraulic modification- chemical modification.

References

1. Mitchell, J (1976), " Fundamentals of soil behaviour", John Wiley and sons, New York
2. Lambe, T. W & Whitman, R. V (1979), " Soil Mechanics ", John Wiley and Sons, New York.
3. Gopal Ranjan & A.S.R Rao (1991), " Basic and Applied Soil Mechanics, Wiley Eastern Ltd., New Delhi.
4. Wilson, M. J (1987), " A Hand book of Determinative methods in Clay Mineralogy", Chapman and Hall, New York.
5. Robert M. Koerner (1984), "Construction and Geotechnical methods in Foundation Engineering", McGraw Hill Book Co., New York.
6. Yong R. N. (1992), " Principles of contaminant Transport in Soils, "Elsevier, New York.
7. Ramanatha Iyer T. S (2000), "Soil Engineering Related to Environment", LBS centre.

SOIL STABILITY ANALYSIS (ELECTIVE - III)

C806-5 ***2+1+0***

Module 1

Ground water seepage- Laplace's equations for two dimensional flow- quick sand condition- construction of flownets- confined and unconfined flow-seepage in anisotropic soil conditions-piping-design of filters.

Module 2

Stability of earth slopes-modes of slope stability- analysis of slope stability problems- Swedish circle method- Friction circle method- Taylor's stability chart-Bishop's method- stabilization measures- instrumentation.

Module 3

Landslides: Introduction- movements associated with landslides-causes of landslides-consequences, classification and analysis of landslides-investigation of landslides-instrumentation-methods of preventing landslides.

Module 4

Earthquake effects on soil foundation system: earth quakes- ground shaking-liquefaction- ground deformations-seismic provisions in building codes

Module 5

Underpinning: Introduction-reasons-pit underpinning-pile underpinning-driven underpinning piles-shoring-special underpinning methods-moving structures

References

1. Hans.F.Winterkorn and Hsai Yang Fang Foundation Engineering handbook - Van Nostrand Reinhold Company
2. Bowles E.J. Foundation analysis and Design. Mc Graw Hill Publishing Co.
3. Gopal Ranjan and A.S.R.Rao Basic and applied Soil mechanics New Age International Publishing Company
4. Donald.P.Coduto Geotechnical Engineering –Principlesand practices, Prentice Hall India

ENVIRONMENTAL IMPACT ANALYSIS

C806-6 **2+1+0**

Module 1

Concepts of environmental impact analysis-Environmental protections, legislations, laws and Acts-air quality legislation-energy legislation-fish and wild life resources legislation-historical preservation legislation-factors for consideration in assessing environmental impact concept-short term vs. long term effects.

Module 2

Socio impact analysis-physical, social, aesthetic and economic environment-examples of types of socio impact analysis.

Module 3

Air quality impact analysis-air pollutants-sources-atmospheric interactions-environmental impact-assessment methodology, case studies. Noise impact analysis-effects of noise on people-estimating transportation noise impact-examples

Module 4

Water quality impact analysis-water quality criteria and standards-modelling-water quality impact by projects like High ways, power plants, agriculture and irrigation, forest management, vegetation and wild life impact analysis.

Module 5

Assessment methodologies-impact on biota-summerisation of environmental impact-checklist method.

References

1. John G Rau, David C Wooten, Environmental impact Analysis Handbook, Mc Graw Hill Book Company, New Delhi, 1980.

ENVIRONMENTAL ENGINEERING LAB

C807 **0+0+3**

1. Determination of (a) solids - total, suspended, dissolved, fixed, volatile, settleable SVI.
2. pH Value.
3. Conductivity.
4. Chemical oxygen demand.
5. D. 0. and Biochemical Oxygen Demand.
6. Jar test and Turbidity.
7. Chlorine demand and residual chlorine.
8. Determination of iron.
9. Determination of sulphates.
10. Acidity and Alkalinity.
11. Hardness.
12. Nitrogen - various forms.
13. M. P. N. Fecal coliforms using A-l medium.
14. Measurment of smoke density for diesel vehicles.
15. Measurment of H C and CO of exhaust from petrol driven vehicles.
16. Measurment of suspended particulate matter in ambient air.

PROJECT / SEMINAR

C 808 **0+0+4**

Each student is required to present a technical paper on a subject approved by the department. The paper should in general reflect the state of the art. He/she shall submit a report of the paper presented to the department. In addition to the seminar he/she shall undertake a project work (as a team or individually) in the 7th semester itself in consultation with the guide(s). On completion of the project work, he/she shall present the work done before a panel of staff members, and submit a report of the project work done to the department.

VIVA -VOCE

C809

A comprehensive Viva-voce examination will be conducted to assess the student's overall knowledge in the specified field of engineering. At the time of viva-voce, certified reports of seminar and project work are to be presented for evaluation.