

**MAHATMA GANDHI
UNIVERSITY**

B.TECH. DEGREE COURSE

6TH SEMESTER

**SCHEME
&
SYLLABUS**

2002

**CIVIL ENGINEERING
BRANCH**

CIVIL ENGINEERING

SCHEME 6TH SEMESTER

Course Code	Subject Code	Subject	Duration of Uty. Exam (hrs.)	No. of periods per week (hrs)			Marks			
				Lect.	Tut.	Prac.	Sessional	Theory	Practical	Total
A	C601	Structural Analysis – III	3	3	1	-	50	100	-	150
B	C602	Design of Steel structures	4	3	1	-	50	100	-	150
C	C603	Transportation Engineering -I	3	3	1	-	50	100	-	150
D	C604	Water Resources Engineering - I	3	3	1	-	50	100	-	150
E	C605	Geo Technical Engineering – II	3	3	1	-	50	100	-	150
F	C606	Quantity surveying	3	2	2		50	100	-	150
G	C607	Material testing lab - II	3	-	-	3	50	-	100	150
H	C608	Computer Aided Design -I	3	-	-	3	50	-	100	150
Total			25	17	7	6	400	600	200	1200

SYLLABUS

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 - coning 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, transferring 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, A course 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 resources 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: Sheet piling and bracing 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 and SPT 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

1. Arora K. R, Soil Mechanics & Foundation Engineering, Standard Publishers , Distributors.
2. Joseph E. Bowles, Foundation Analysis and Design, McGraw Hills Publishing Company.
3. Ninan P. Kurian, Modern Foundations, Tata McGraw Hills Publishing Company.
4. Peck, Hansen & Thornburn, Foundation Engineering.
5. W.C. Teng, Foundation Design.
6. 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 TESTING 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) Abrasion 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.

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.

