CE010 601 DESIGN OF STEEL STRUCTURES

Teaching scheme: **Credits: 4**

2 hour lecture and 2 hour tutorial per week

Objective:

To familiarize the fundamental aspects of structural behaviour and design of steel structures satisfying the requirements such as safety,feasibility and economy of steel structures.

Module 1 (12 hours)

Loading standards - I.S structural sections - I.S specifications –Design Philosophies- Working stress method and Limit state method - design of tension members –bolted and and welded connections - design of simple and compound beams - laterally supported and unsupported.(Design examples based on Limit state method only.)

Module 2 (12 hours)

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.

Module 3 (15 hours)

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

Module 4 (10 hours)

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

Module 5 (11 hours)

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

Note: Only Sketches required. Detailed drawing in drawing sheets not required

References

1. Relevant IS Codes. (IS 800-2007 , IS 875, IS 805, IS 801, IS 811,IS 6533 Part 1, Part 2,Steel Tables)
2. Subramanian N, Design of steel structures,Oxford University Press
3.S.S Bhavikatti, Design of steel structures, I.K.International Publishing house Pvt.Ltd.
4. Ramchandra, Design of steel structures Vol. I & II, Standard book house, Delhi.
5. S.K. Duggal, Design of steel structures ,Tata Mc Graw-Hill
6. B.C.Punmia, Design of steel structures, Laxmi publications.

CE010 602 GEOTECHNICAL ENGINEERING – II

Teaching scheme: **Credits: 4**
2 hour lecture and 2 hour tutorial per week

Objective:
Civil Engineer has many diverse and important encounters with soil. The knowledge of soil Mechanics is helpful in the design of foundations, earth retaining structures ,pavements ,excavations, embankments and dams.
The objective of the course is to make the students aware of various soil investigation methods, theoretical and practical approach to calculate the bearing capacities of different foundations and the design of various sub structural elements.

Module 1 (12 Hours)

Site investigation and Soil exploration: Objectives - Planning – Stages of Explorations- - Depth and spacing of borings-Methods of explorations- test pits, borings (auger boring and wash boring)- sub surface soundings (standard penetration and cone penetration) - geophysical methods (seismic refraction and electrical resistivity methods) –Samples- disturbed and undisturbed samples -sampling tools- - Bore log - Soil profile - Location of water table.

Stress Distribution: Boussinesque's equations for vertical pressure due to point loads, line load and uniformly loaded circular area. - assumptions and limitations - Pressure bulb- Newmark charts and their use.Wetergaard's equation for point loads-appriximate methods of stress distribution.

Module 2 (12 Hours)

Earth Pressure: General & local State of plastic equilibrium. Earth pressure at rest , active and passive. Rankine's and Coulomb's theories of cohesion less and cohesive soils - Iinfluence of surcharge and water table.Rehban's and Culman's graphical methods. Sheeting and bracings in excavations.

Sheet Piles**:** Common types of sheet Piles – Uses of sheet pile walls

Module 3 (12 Hours)

Bearing capacity: Definitions - ultimate and allowable - plate load test - - Terzaghi's and Skempton's analysis - bearing capacity factors and charts - effect of water table - 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 (12 Hours)

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 (12 Hours)

Raft foundation: Types of rafts- 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.Wiley Eastern Limited
5. W.C. Teng, Foundation Design.Prentice Hall of India
6. Hans. F. Winterkorn & Hsai Yang Fang, Foundation Engineering Hand Book, Van Nostrand Reinhold Company.
7. B. C Punmia,Soli Mechanics and Foundation Engineering,Laxmi Publications.
8. V.N.S. Murthy,Text book of Soil Mechanics and Foundation Engineering,CBS Publishers

CE010 603 STRUCTURAL ANALYSIS II

Teaching scheme **Credits: 4**

3 hour lecture and 1 hour tutorial per week

Objective:

To equip the students with the comprehensive methods of structural analysis of indeterminate structures

To give an introduction to Theory of Elasticity and Structural Dynamics.

Module 1 (10 hours)

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.

Module 2 (12 hours)

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 3 (12 hours)

Kani's method-continuous beams & frames (without sway only).

Influence line diagrams for statically indeterminate structures: Muller Breslau' s principle-Influence lines for reactions-shear force-bending moment-propped cantilever& two span continuous beams.

Module 4 (14 hours)

Elementary theory of elasticity: State of stress at point- stress tensor-equilibrium

Equations - stresses on arbitrary plane- principal stresses-strain components – strain tensor- compatibility equations- boundary condition equations Two dimensional problems- plane stresses - plane strain – compatibility equations in two dimensional cases- Airy's stress functions

Module 5 (12 hours)

Introduction to Structural Dynamics-Dynamic systems and loads-Free or natural vibrations-Natural Frequency- Inertia force- -D'Alembert's principle-Mathematical modeling of single degree of freedom systems- equivalent spring stiffness of combination of springs

References

1. Timoshenko S.P., Theory of Elasticity, McGraw Hill.
2. Sreenath L. S, Advanced Mechanics of Solids, Tata McGraw Hill Education P. Ltd.
3. Sadhu Sindh, Strength of Materials, Khanna Publishers, 1988.

4. Bhavikatti S.S , Structural Analysis Vol. II, Vikas Publishing House (P) Ltd.
5. Seeli F.B.&Smith J.P., Advanced Mechanics of Materials, John Wiley & Sons, 1993.
6. Vazirani & Ratwani, Analysis of Structures, Khanna Publishers, New Delhi.
7. B.C. Punmia, Theory of Structures, Vol. II, Laxmi Publishers, New Delhi.
8. Prakash Rao D.S., Structural Analysis, Universal Press Ltd, Hyderabad, 1997.
9. Ameen A, Computational Elasticity, Narosa Publishers.
10. Ray W Clough, Joseph Penzien, Dynamics of structures, Mc Graw Hill, Kogabusha Ltd.
11. Madhujith Mukopathyay, Structural Dynamics, vibrations&systems, Ane Books Pvt. Ltd, 2008.
12. V.K.Manicka Selvam, Elementary Structural Dynamics, Dhanpat Rai Publications Pvt.Ltd.
13. Mario Paz, William Leigh, Structural Dynamics, Springler.

CE010 604 TRANSPORTATION ENGINEERING - I

Teaching scheme: **Credits: 4**
3 hour lecture and 1 hour tutorial per week

Objective: *To gain an in-depth knowledge on operating characteristics of facilities such as railways and water transportation*

Module 1(15 hours)

Introduction: Transportation modes - comparison and characteristics of highway and railway. Modern developments – Surface, elevated and tube railways, light rail transit, high speed tracks - technologies

Railway track: Alignment- basic requirements and factors affecting selection, Component parts of a railway track - requirements and functions - Typical cross section - Rails – functions and requirements, Type of rail sections, rail fastenings, wear and creep of rails - coning of wheels, Train resistances and evaluation of hauling capacity and tractive effort of locomotive.

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

Module 2 (10 hours)

Railway operation and control: Points and Crossings – Design features of a turn out – Details of station yards and marshalling yards – Signaling, interlocking of signals and points - Principles of track circuiting - Control systems of train movements – ATC, CTC – track circuiting

Module 3 (10 hours)

Tunnel Engineering: Tunnel - sections - classification - tunnel surveying - alignment, transferring centre, grade into tunnel – tunnel driving procedure - shield method of tunneling, compressed air method, tunnel boring machine, Tunnel lining, ventilation - lighting and drainage of tunnels.

Module 4 (15 hours)

Harbour Engineering: Harbours – classification, features, requirements, winds and waves in the location and design of harbours.

Break waters - necessity and functions, classification, alignment, design principles, forces acting on break water – construction, general study of quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings .

Module 5 (10 hours)

Dock Engineering: Docks - Functions and types - dry docks, wet docks – form and arrangement of basins and docks – design and construction – dock entrances - floating dry docks, slip ways, dock entrances and caissons. Dredging – functions -

general study of dipper dredger, grapple dredger, ladder dredger and hydraulic dredger.

References

1. Rao G. V, Principles of Transportation and Highway Engineering, Tata McGraw Hill
2. Mundrey J. S, Railway Track Engineering, Tata McGraw Hill
3. S.C. Rangawala, Railway Engineering, Charotor Publishing House
4. S. C Saxena and S. P Arora., Railway Engineering, Dhanpat rai & Sons
5. Subhash C. Saxena, Railway Engineering, Dhanpat rai & Sons
6. R. Srinivasan, Harbour, Dock & Tunnel Engineering, Charotor Publishing House
7. S.P.Bindra, A course in docks and Harbour Engineering, Dhanpat rai & Sons

CE010 605 WATER RESOURCES ENGINEERING

Teaching scheme: **Credits:4**

3 hours lecture and 1 hour tutorial per week

Objective :

Students are expected to realize the importance of water resources and its application in irrigation engineering.

Module 1 (15 hours)

Irrigation: Definition-necessity of irrigation - environmental effects of irrigation - sources of water - irrigation systems- lift and flow irrigation – modes of irrigation - layout of irrigation schemes -historical development of irrigation in India through ages. Soil-water-plant relation – 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 (15 hours)

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 (15 hours)

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. Infiltration galleries and wells.

Module 4 (15 hours)

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 5 (12 hours)

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 Garg, Irrigation and hydraulic structures, Khanna Publishers, Delhi
3. R.K.Linsley, M.A.Kholar&J.L.H.Paulhur, Hydrology for Engineers, Mc Grawhill bookco., 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

CE010 606L01 ADVANCED SURVEYING
(ELECTIVE I)

Teaching Scheme **Credit:4**

2 hours lecture and 2 hours tutorial per week**.**

Objective:

To make the students aware of the advanced methods of surveying.

Module 1(12 Hours)

Total station surveying-study of instrument-measurement of parameters-methods of surveying-transferring data-software's-auto plotter-plotting (assignment).

Module 2 (12 Hours)

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

Module 3 (12 Hours)

Remote sensing: 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 4 (12 Hours)

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 5 (12 Hours)

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.

CE010 606L02 OPEN CHANNEL AND COASTAL HYDRAULICS (ELECTIVE - 1)

Teaching Scheme **Credit:4**

2 hours lecture and 2 hours tutorial per week**.**

Objective:

To develop theoretical and practical knowledge on open channel flow and to acquire basic knowledge on Ocean Engineering **and related applications**.

Module 1(12 Hours)

Open channel flow-Definition-Importance-Classification of flows

Uniform flow- Resistance equation-Chezy's and Manning's equation-roughness coefficient.-factions affecting roughness coefficient- normal depth and its computation-conveyance – section factor - specific energy - specific force - diagram – critical flow - section factor -hydraulic exponent for critical flow computation and its use for trapezoidal channel-Application of specific energy and specific force in open channel

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Module 2(12 Hours)

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

.**Module 3(12 Hours)**

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

Module 4(12 Hours)

Water waves - classification into periodic oscillatory, periodic progressive, uniformly progressive, solitary and stationary waves.

Ocean waves – Introduction-characteristics-classification based on wave period. Small amplitude wave theory .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 Transformations –shoaling- refraction- reflection-diffraction –wave breaking (description only.

Module 5(12 Hours)

Long period waves-astronomical tide-tsunami, basin oscillations, storm surge, climatologic effects, geologic effects(description only)

Wave forecasting - SMB method.

Coastal erosion with special reference to the Kerala Coast

Shore protection measures – break waters of different types-sea walls – tetrapods, groynes and beach nourishment.

References

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 Willey & Sons

CE010 606 L03 AIRPORT ENGINEERING (ELECTIVE I)

Credits 4

Teaching scheme: 2 hour lecture and 2 hour tutorial per week

Objective: *To understand the various aspects of air transportation and airport operation and design.*

Module 1 (15 hours)

Introduction – history of air transport - structure and organization –- selection of site – surveys – drawings to be prepared - Airport planning – components of airport system – airport planning studies – elements of study – forecasting - levels – methodologies – extrapolation methods – market analysis models – forecasting requirements – applications

Aero plane component parts - Aircraft characteristics – classification of airports

Airport obstructions - clear zone and turning zone - zoning laws - regional planning – airport architecture – environmental considerations

Module 2 (12 hours)

Runway design – orientation - windrose and layout of runways - basic runway length and corrections required - geometric design - balanced field concept - Terminal area – planning and design – passenger flow – size of apron – apron turntable - hangars – protection from jet blast

Module 3 (12 hours)

Airport capacity – capacity and delay – runway capacity related to and not related to delay - Air traffic control – flight rules - service station – Air Traffic Control network – aids for the control of air traffic – automation in air traffic control

Module 4 (11 hours)

Airport pavements – design factors – design methods for flexible and rigid pavements – CBR method – McLoad method – Burmister method – Analytical method –design charts – Load Classification Number System – Joints in cement concrete pavements

Module 5 (10 hours)

Taxiway design - loading aprons - holding aprons - separation clearances – visual aids - airport markings - marking of runways, taxiways - Airport lighting - lighting of runways approaches, taxiways and aprons.

References

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1. S.K. Khanna, M. G. Arora, S.S. Jain, Airport Planning & Design, Nem Chand Publishers
2. S. C. Rangwala, Airport Engg., Charotar Publishing Co.
3. Robert Horenjeff & Francis X McKelvy, Planning and design of airports, Mc Graw Hill.

CE010 606L04 ADVANCED MECHANICS OF MATERIALS (ELECTIVE-1)

Teaching Scheme **Credit:4**

2 hours lecture and 2 hours tutorial per week**.**

Objective

To review and make more useful methods and results presented in the previous courses on Mechanics of materials.

To understand the limitations of the ordinary formula of Strength of materials and to extend the subject to include a variety of important topics more complex than those usually involved in earlier courses.

Module 1 (13 Hours)

Basic concepts – Body force – Surface force – Stresses and strains – Three dimensional stresses and strains – Transformation equations of 3D stresses and strains – Principal stresses & strains – States of stresses and strain – Equilibrium equations – Generalised Hooke's Law – Compatibility Conditions – Boundary conditions.

Module 2 (13Hours)

Two dimensional problems – Plane stress and plain strain – Transformation equations – Stress–strain relations – Equilibrium equations in cartesian and polar co-ordinates – Airy's stress function – Biharmonic Equilibrium – 2D problems in Cartesian coordinate – Cantilever with concentrated load at free end – Simply supported beam with uniformly distributed load.

Module 3 (12Hours)

Torsion – Torsion of prismatic bar – General solution – Warping function approaches – St. Venant's theory – Membrane analogy – Sand heap analogy – Torsion of Non Circular sections – Torsion of multi cell and thin walled open and closed sections.

Module 4 (11Hours)

Curved flexural members – Winkler- Bach formula – Equivalent area methods – Circumferential stress in curved beams having, I,T or similar cross sections – Closed ring with circumferential load and uniform loads – Chain links.

Module 5 (11Hours)

Beam on Elastic foundation – General theory – Infinite beam subjected to concentrated load – Beam with uniformly distributed loads – Short beams.

References:–

1. Timoshenko S P and Goodier J. N, *Theory of Elasticity*, Tata Mcgraw Hill International Student Edition.
2. Sadhu Singh, *Theory of elasticity*, Khanna Publishers, Delhi.
3. Srinath L. S, *Advanced mechanics of solids*, Tata McGraw– Hill Publishing Company Ltd., New Delhi.

4. Arthur P Boresi & Omar M SideBottom, *Advanced Mechanics of Materials*, John Wiley & Sons.
5. Hetenyi, *Beam on elastic foundation*

CE010 606L05 CONCRETE TECHNOLOGY
(ELECTIVE - I)

Teaching scheme: **Credits: 4**
2 hour lecture and 2 hour tutorial per week

Objective:
Concrete technology is one of the important disciplines of Civil Engineering involving the study of engineering properties and behaviour of concrete.

Module 1(13 hours)

Concrete materials: cement: Bough's chemical compositions, Additives, Test for properties of cement- Physical, Chemical, Relevance and IS specification. Hydration – Product of hydration, Phases of concrete, Structure of Hydrated cement paste (HCP), Solids in HCP, Voids in HCP, Water in HCP. Structure property relationship in HCP: Strength, Dimensional stability and Durability. Transition Zone in concrete:- Significance of transition zone, Structure of transition zone ,Strength of transition zone and Influence of transition zone. Aggregates: - requirements, size , shape and texture, Grading of aggregate, Aggregates crushing strength, Specific gravity, Flakiness index, Elongation Index, Impact value, Abrasion value, IS specification. Alkali aggregate reaction. Water: - General requirement, Quality.

Module 2 (12 hours)

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 (12 hours)

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 (12 hours)

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 (11 hours)

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 Technologyeferences:
4. A.R Santhakumar-Concrete Technology- Oxford University Press

CE010 606L06 SOIL STABILITY ANALYSIS
(ELECTIVE - 1)

Teaching Scheme **Credit:4**

2 hours lecture and 2 hour tutorial per week.

Objective:

Slope stability problem like,slides,flows and falls often produce extensive property damage and therefore geotechnical engineers frequently need to evaluate the stability of existing slopes and proposed slopes. The objective of the course is to make the students aware of various causes of failures of slopes and study the remedial measures

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Module 1 (12 hrs.)

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 (12 hrs.)

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 (12 hrs.)

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 (12 hrs.)

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

Module 5 (12 hrs.)

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

CE010 607 COMPUTER AIDED DESIGN AND DRAFTING LAB

Teaching Scheme **Credit: 2**

3 hours practical per week

Objective

To provide familiarity with functional requirements and regulations related to buildings and to enable students to prepare neat building drawings with CAD software so as to minimize effort and maximize output.

Exposure to different categories of building (Private, Public, Residential, Flats, Offices, Clubs/Recreational buildings etc.- **Local visit and preparation of sketches**

Functional requirements of buildings – Different functional units of a building- Requirements regarding Area, Height, Head room, Width of passage way, Lighting, Ventilation, Public amenities, Setback, Parking, clearance from electric lines, Provision and location of septic Tank-clearance from well, Familiarity with norms in National Building Code and local building rules. **Study of building plans** (Residential / Commercial / Public buildings / Office/Flats / Cottages etc.) **sanctioned by local authority**.

Preparation of 2D drawing- Advantages of CAD over manual drafting- Features of CAD software-menus and tool bars-Concept of drawing in true size- Drawing units- Drawing tools-Editing tools- Controlling display-(zoom, pan, regeneration, redraw) Productivity tools-mirror,copy,block,array,Detailing-layers,color,linetype,ltscale,hatch Inquiry –area, dimension Plotting- scale. Specifications for drawings

Preparation of 3D drawings- Concept of 3D drawing- viewpoint, real-time 3D rotation, 3D modeling techniques- wire modeling, surface modeling, surface revolution, 3D face. Elevation and thickness - addition and subtraction of 3d objects. Shading - rendering.

Application of CAD to Civil Engineering Drawing with emphasis on architectural appearance. Residential, Public buildings complete in all aspect including layout plan, section, elevation, details/specifications/joinery and site plan taken in standard scale with title block.

Exposure to 3D studio and 3D Max

A term project submitted individually and suitable for submitting to local bodies for approval incorporating local building rules and NBC provisions is compulsory for external evaluation.

Assignments:- Submission of neat dimensioned line sketches from local visit
Collection and study of approved building plan
Preparing an Elevation for given plans
Preparing Plans based on requirements of clients.

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 Auto CAD2002, Tata McGraw Hill.
6. Sham Tickoo, Auto CAD2002 with applications, Tata McGraw Hill.

CE010 608 MATERIAL TESTING LABORATORY - II

Teaching scheme **Credits: 2**

3 hours practical per week

Objective:

To study properties of concrete and its various constituent materials.

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.

References

1.A.R.Santhakumar,Concrete Technology,Oxford University Press,Chennai.
2. M. S. Shetty, Concrete technology, S.Chand & Co.