B.Tech. Civil Engineering

SYLLABUS

CREDIT BASED CURRICULUM

(2010 - 2014)

DEPARTMENT OF CIVIL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI - 620 015, INDIA.
CURRICULUM

B. Tech. (CIVIL ENGINEERING)

The total minimum credits required for completing the B.Tech. Program in Civil Engineering is 178 (45 + 133).

SEMMESTER III

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## ELECTIVES

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SEMESTER III

MA203  PROBABILITY, STATISTICS AND LINEAR PROGRAMMING

Total, Compound, Marginal and conditional probability, Bayes’ theorem - Binomial, Poisson and Normal distributions, Moment generating function, Characteristic function
Central Limit Theorem, Law of large numbers, Tests of significance, large and small samples, t- test, F- test and chi-square test for goodness of fit.
Estimation theory, ANOVA table and analysis, Multiple and partial correlation - Regression
Convex spaces, LPP statement, basic feasible solution, Graphical solution - Slack and surplus variables - Artificial variable technique - Charne’s penalty method - Two phase method - Dual simplex method - Primal dual problems, Transportation and Assignment problems.
Integer programming - Gomory's cutting plane method - Branch and bound method

References


CE201 MECHANICS OF SOLIDS – I

Tension, compression and shear stresses - Hooke’s law - elastic constants - compound stresses - composite bars - thermal stresses.
Strain Energy due to axial force - Resilience - stresses due to impact and suddenly applied load - Principal stress and principal planes - Mohr's circle
Beams and support conditions - Types of supports and loads - shear force and bending moment - their diagrams for simply supported beams, cantilevers and overhanging beams. Theory of simple bending - Stress distribution at a cross section due to Bending Moment and Shear - strain energy.
Theory of torsion - Torsion of circular and hollow circular shafts and shear stresses due to torsion - closed and open coiled helical springs - leaf spring.

References


CE203 MECHANICS OF FLUIDS – I

Continuum concept - CGS, MKS and SI systems - Properties of Fluids - Ideal and real fluid - Pressure at a point – pressure variation - pressure measurement
Hydrostatic forces on plane and curved surfaces - Buoyancy and equilibrium - Metacentric height and its determination-Types of flow - continuity equation for one, two and three dimensional flows - stream function and velocity potential - flow net and its properties
Convective and local acceleration - Pressure, Kinetic and Datum energy - Bernoulli’s theorem and proof - Euler's equations of motion for a three dimensional flow and along a streamline - Deduction of Bernoulli’s theorem - Momentum equation - applications.

References


CE205 SURVEYING - I


References


CE207 GEOTECHNICAL ENGINEERING - I

Historical development of Soil Engineering - Origin and general types of soils - soil structure, clay minerals-Three phase system- Identification and Classification of soils Soil water - capillary phenomena - concept of effective and neutral stresses - Permeability - determination of coefficient of permeability in the laboratory - Seepage flow - Head, gradient, pressure - steady state flow - two dimensional - flow net.
Vertical stress distribution in soil - Boussinesq and Westergaard's equation - Newmark's influence chart - principle, construction and use - Equivalent point load and other approximate methods - pressure bulb. Compaction
Shear strength - Mohr-Coulomb failure criterion - shear strength tests - Different drainage conditions - Shear properties of cohesionless and cohesive soils - Use of Mohr's circle - relationship between principal stresses and shear parameters.
Compressibility and consolidation - Terzaghi's one dimensional consolidation theory - pressure void ratio relationship - preconsolidation pressure - Total settlement and time rate of settlement - coefficient of consolidation - curve fitting methods - Correction for construction time.

References


CE209 CONCRETE TECHNOLOGY

Introduction - Concrete materials - Cement: Physical tests on cement - Concrete materials - Tests on aggregates - Quality of Water for mixing and curing - use of sea water for mixing concrete
Mix Design - factors influencing mix proportion - Mix design by ACI method and I.S. code method - Design of high strength concrete,
Admixtures - accelerating admixtures - Retarding admixtures - water reducing admixtures - Air entraining admixtures - coloring agent - Plasticizers. Batching - Mixing -Transportation - Placing of concrete - curing of Concrete
Special Concrete - light weight concrete - Fibre reinforced concrete - Polymer-polymer modified concrete - Ferrocement - Mass concrete - Ready mix concrete- Self compacting concrete- Quality control - Sampling and testing-Acceptance criteria

References


CE211 BUILDING PLANNING AND DRAWING

Classification of buildings - Principles of planning - Dimensions of buildings - Building bye-laws for floor area ratio, open spaces - Orientation of buildings - Lighting and Ventilation- Planning and preparing sketches and working drawings of Residential buildings (Flat and sloping roof), Schools, Hostels,
Hospitals, Single-storey factory buildings with trusses. Detailed working drawings of the component parts - Doors and Windows - Roof Trusses - Staircases-Toilets

References


CE213 SURVEY LAB – I

1. Chain surveying
2. Chain traverse
3. Compass surveying
4. Compass traverse-open and close traverse
5. Plane table surveying
6. Leveling: Fly leveling and contouring
7. Radiation, intersection-Traverse- Resection

CE215 GEOTECHNICAL LAB

1. Grain Size analysis
2. Consistency limits
3. Specific gravity
4. Permeability tests
5. Unconfined compression test
6. Direct shear test
7. Core cutter and sand replacement
8. Compaction test
9. California bearing ratio test
10. Vane shear test
11. Triaxial test
12. Consolidation test

SEMESTER IV

MA202 NUMERICAL TECHNIQUES

Solution of linear system - Gaussian elimination and Gauss-Jordan methods - LV decomposition methods - Crout's method - Jacobi and Gauss-Seidel iterative methods sufficient conditions for convergence - Power method to find the dominant eigenvalue and eigenvector
Solution of nonlinear equation - Bisection method - Secant method - Regula falsi method - Newton-Raphson method for f(x) = 0 and for f(x,y) = 0, g(x,y) = 0 - Order of convergence - Horner's method - Graeffe's method - Bairstow's method.
Numerical solution of Laplace equation and Poisson equation by Liebmann's method solution of one dimensional heat flow equation - Bender - Schmidt recurrence relation Crank - Nicolson method -
Solution of one dimensional wave equation.

References


CE202 MECHANICS OF SOLIDS – II


References


CE204 MECHANICS OF FLUIDS - II


References

CE206 SURVEYING – II
Trigonometrical levelling – Observations for heights and distances – Geodetic observations – Corrections for refraction, curvature, axis signal – Reciprocal observations.

References

CE208 GEOTECHNICAL ENGINEERING – II
Soil exploration - Planning - Augur boring - Soundings - Sampling - Plate load test, static and dynamic penetrations tests - geophysical explorations - Lateral Earth Pressure - Plastic equilibrium - Rankine's theory - Active and passive earth pressure for cohesionless and cohesive soils - Earth pressure at rest - Coloumb's wedge theory - Rehbann's and Culmann's graphical solutions, Stability analysis Foundation - functions and requisites- Different types - choice of foundation type – general principles of design. Bearing capacity - types of failures - Prandtl's and Terzaghi's bearing capacity analysis - Bearing capacity based on settlement and building codes Shallow foundation - spread footings - combined footings - trapezoidal and strap footings - Raft foundation - Contact pressure distribution - settlement analysis - Types of settlement, control Deep foundation - piles - types - load carrying capacity of pile - static and dynamic formula - pile load test - penetration test - pile groups - Efficiency - Feld's rule - Converse Labarre formula, Settlement of piles and pile groups - Negative skin friction - under reamed piles

References
CE210 ENVIRONMENTAL ENGINEERING - I

Physical, chemical and biological characteristics of water - water analysis- IS and WHO standards- Requirements of water supply - Types of demand and their contribution - rate of consumption - Forecasting the population- variation in demand pattern.
Sources of water - quantitative and qualitative studies. Intakes - Channels and pipes for conveying water -- Pipes- hydraulic design of pressure pipe- Materials - laying- joining- testing - pipe appurtenances- Pumps and pumping stations
Treatment plants - process of treatments - mixing, aeration, sedimentation, coagulation, filtration, disinfection, softening - advanced water treatment. Distribution systems - analysis of distribution networks
Operation and maintenance of water supply to buildings - Rural water supply - Protected water supply - Saline water intrusion.

Note: Assignments include the drawings of various water treatment units.

References

1. Manual on Water supply and Treatment - CPHEEO, 1999

CE214 SURVEY LAB – II

1. Theodolite surveying
2. Single plane observation of trigonometrical leveling
3. Two plane method
4. Determination of Tacheometric Constants
5. Tangential Tacheometry
6. Subtense Bar
7. Setting out of curves, Buildings layout.
8. Total station

CE216 STRENGTH OF MATERIALS LAB

1. Test on springs
2. Deflection test
3. Torsion test
4. Tension test
5. Hardness test
6. Tests on brick
7. Tests on cement
8. Tests on concrete
9. Tests on aggregate
10. Tests on bitumen
SEMESTER V

CE301 ENVIRONMENTAL ENGINEERING – II

Characteristics and composition of sewage-sampling-analysis- population equivalent - drainage in buildings-plumbing systems for drainage
Primary treatment- Secondary treatment- biokinetics- Lagooning- sludge digestion-Tertiary treatment
Disposal standards- self purification of rivers- Streeter Phelps equation - oxygen sag curve
Toxic and hazardous wastes - equalization and neutralization- biological degradation- recycle and reuse of waste effluents- treatment of industrial wastes- Dairy, Tannery, Petrochemical, Fertilizer, textiles, Pulp and paper
Air pollution-effects- stack emission- automobile exhaust - control devices-solid waste Management - EIA.

Note: Assignments include the designs and drawings of various wastewater treatment units.

References

CE303 STRUCTURAL ANALYSIS – I

Slope deflection method - analysis of indeterminate structures- Settlement.
Moment distribution method - analysis of indeterminate structures - settlement of supports - sway.
Energy methods - Kani’s method - analysis of indeterminate structures - settlement of supports - sway.
Moving loads for statically determinate structures - single load - two point loads - several points loads - maximum bending moment and maximum shear force - equivalent u.d.l. - absolute maximum bending moment.
Enveloping curves for maximum bending moment and maximum shear force and determination of equivalent UDL, ILD for shear, moment and reactions for statically determinate beams and pinjointed trusses - Reversal of stresses under live load.

References

CE305 CONCRETE STRUCTURES – I

Stress strain behavior of steel and concrete- Introduction to working stress method - permissible stresses. Limit state method-Limit states - Characteristic strength and load - Partial safety factor - Design of singly and doubly reinforced beams, T and L beams - Design for Shear and Torsion. Slabs - one way and two way slabs for different edge conditions - Yield line theory - Flat slab - continuous slabs - stair cases - different types. Columns - axially loaded and eccentrically loaded
columns - Interaction Diagrams. Footings - isolated footings - square, rectangular and circular footings - Combined footing Pile and pile cap- Introduction to masonry structures.

**Note:** Assignments include the design and drawings of various R.C.C structural elements.

**References**


**CE307 STEEL STRUCTURES-I**


**Note:** Assignments include the design and drawings of various steel structural elements.

**References**


**CE309 HYDRAULIC MACHINERY**

Reciprocating pump - Description and working - types - discharge and slip - power required to drive the pump - Indicator diagram - Air vessel - work done against friction with and without air vessels.
Working principle and use of the following hydraulic pumps and machines - Deep well pumps - submersible and jet pumps, special pumps - Gear pump - screw pump, sewage pump, miscellaneous machines - Hydraulic press - hydraulic accumulator - Hydraulic ram.

References

CE311 ADVANCED STRENGTH OF MATERIALS

Principal stresses in a 3D field. - Computation - Mohr's Circle - Lame's Ellipsoid. Theories of failure - Criteria for Failure - Different failure theories for ductile and brittle materials. Equivalent bending and twisting moments.
Unsymmetrical bending- Properties of unsymmetrical sections- Circle of inertia - Dyadic circle - Momental ellipse- Stresses and deflection due to unsymmetrical bending - Concept and relevance of Z polygon.
Shear Centre - Concept and significance - Shear flow for thin walled open sections-Location of shear centre for singly symmetric sections. Stresses in curved flexural members-Winkler Bach Formula - Crane hooks - rings and links.
Fundamentals of vibration - free vibration of single degree of freedom systems - Undamped and damped free vibration with different types of damping.- Resonance-Harmonic response of single degree of freedom systems with and without damping.

References

CE313 FLUID MECHANICS LAB
1. Determination of pipe friction
2. Calibration of flow meters - Venturimeter and Orifice meter
3. Determination of discharge coefficients for notches
4. Determination of minor losses
5. Pressure gauge calibration.
6. Centrifugal pump
7. Submersible pump
8. Reciprocating pump
9. Jet pump
10. Gear pump
11. Screw pump
12. Francis Turbine
CE315 ENVIRONMENTAL ENGINEERING LAB

1. Physical characteristics of water
2. Chemical characteristics of water
3. Bacteriological tests
4. Microscopic tests
5. Jar test
6. Chlorine demand and residual test
7. Total solids and settleable solids.
8. Organic and inorganic solids.
9. Determination of pH and chemical constituents like Cl\(^-\), Fe\(^{2+}\) etc.

SEMESTER VI

CE302 STRUCTURAL ANALYSIS – II

Influence lines - Maxwell Betti's theorem - Muller Breslau's principle and its application. Influence lines for continuous beams and single bay, single storey portals with prismatic members.
Analysis of plane truss with one or two redundants - trusses with lack of fit - Thermal stresses - Settlement of supports - Trussed beams.
Theory of arches - Analysis of three hinged, two hinged and fixed arches - influence lines, rib shortening, settlement and temperature effects.
Analysis of cables - Suspension bridges with three and two hinged stiffening girders - influence lines.
Analysis of multistorey frames for gravity and lateral loads by approximate methods - Substitute frame - Portal and Cantilever methods.

References


CE304 TRANSPORTATION ENGINEERING - I

Introduction: Importance of transportation, different modes of transportation, characteristics of road transport, scope of highway and traffic engineering
Highway development and planning: Importance, classification of roads, road patterns, planning surveys; highway alignment and surveys
Highway Geometric Design: Cross section elements, sight distance, design of horizontal and vertical alignment
Traffic Engineering: Traffic characteristics - Traffic studies-speed, volume, speed and delay, origin-destination, parking and accident studies; capacity of urban roads and highways; traffic operations-regulation and control; design of intersections- at grade and grade separated
Pavement Materials and Design: Specifications and tests on pavement materials, pavement design factors, design of flexible and rigid pavements as per IRC.

References


CE306 CONCRETE STRUCTURES – II

Earth Retaining structures - Retaining walls- types - cantilever and counterfort - design - drainage and other construction details. Liquid Retaining structure - Water tanks - types - square, rectangular, circular - Design of underground and elevated tanks - design of staging - spherical & conical roof for circular tanks. Material storage structures - Determination of lateral pressure on side walls of bunker - Rankine’s theory - design of bunker - design of circular silo using Jansen’s theory. Environmental Structures - Chimneys - Principles and Design - Design of long columns. Transportation structures - Bridges - Slab bridge - Design of single span slab bridge - Tee beam bridge - Design of Tee beam bridge with stiffness - Tee beam bridge with cross girders

Note: Assignments include the design and drawings of various RCC structures.

References


CE308 STEEL STRUCTURES-II

Eccentrically loaded column - simple and compound section - lacings and battens - column bases – slab base – gusseted base – moment resistant base plate
Welded plate girders – analysis and design using IS800-2007 - curtailment of flange plates – stiffeners – analysis and design of gantry girder
Introduction to IS875 part (3) – assessment of wind load – analysis and design of steel stacks - functional and structural requirements - self supporting and guyed stacks - base plate and anchor bolt
Light gauge steel sections-types of cross section - Local and post buckling - Effective width concept-Compression and Flexural members.

Note: Assignments include the design and drawings of various steel structures.

References

CE310 WATER RESOURCES ENGINEERING

Hydrologic cycle - rainfall and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Theissen polygon and Isohyetal methods - Runoff -infiltration indices - Storm Hydrograph and unit hydrograph
River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers - river training
Reservoir planning - Investigations - zones of storage in a reservoir - single purpose and multipurpose reservoir - determination of storage capacity and yield - reservoir sedimentation - Reservoir life - Sediment prevention - Flood estimation- Flood forecasting - Flood routing
Ground water - types of aquifers - storage coefficient - coefficient of transmissibility - steady radial flow into a well located in an unconfined and confined aquifers - Tube wells and Open wells - yield from an open well.

References


CE312 COMPUTER AIDED DESIGN – I

Application Programs
b. Solution of linear simultaneous equations using Gauss elimination.
c. Matrix inversion using Gauss Jordan method
d. Linear regression line of given points
e. Curve fitting using Polynomial Regression
f. Eigen value extraction using Power method

Standard packages to solve the above problems-Solution of Linear Programming problems using standard software-Basic 2D objects - line, polyline, circle, ellipse - editing objects - trim, break, change, stretch - dimensioning - preparation of plan, elevation and section drawings of simple structural objects - printing and plotting drawings - script files - introduction to 3D

DBMS concepts - Civil Engineering Databases - Manipulation - Spreadsheet concepts - Worksheet calculations in Civil Engineering - Regression, Matrix Inversion, etc.

References


CE314 ESTIMATION, COSTING AND VALUATION

Preparation of detailed estimates - Preparation of specifications report accompanying the estimate

Approximate methods of Costing - types of estimate - costing for various structures - rate analysis -

References


SEMESTER VII

CE401 MATRIX METHODS OF STRUCTURAL ANALYSIS

Strain energy - Stiffness and flexibility matrices from strain energy - Symmetry and other properties of stiffness and flexibility matrices - Betti’s law and its applications - Strain energy in systems and in elements.
Determinate and indeterminate structures - Transformation of element matrices to system matrices - Transformation of system vectors to element vectors - Normal coordinates and orthogonal transformations.
Flexibility method applied to statically determinate and indeterminate structures - Choice of redundants - Transformation of redundants - Internal forces due to thermal expansion and lack of fit.
Development of the method - Internal forces due to thermal expansion and lack of fit - Application to symmetrical structures - Comparison between stiffness and flexibility methods.

References

2. Rajasekaran S, Computational Structural Mechanics, Prentice Hall of India, New Delhi, 2001

CE403 TRANSPORTATION ENGINEERING - II

Railway Engineering - Location surveys and alignment - Permanent way - Gauges - Components - Functions and requirements - Geometric design
Track Junctions - Points and crossings - types and functions - design and layout - simple problems - Railway stations and yards. Signaling and interlocking - control systems of train movements.
Airport Engineering - Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons - Terminal area planning
Docks and Harbours - Types - Layout and planning principles - breakwaters - docks - wharves and quays - Transit sheds - warehouses - navigation aids.

References

CE405 IRRIGATION AND HYDRAULIC STRUCTURES

Irrigation - necessity - Types of irrigation - Methods of supplying water - Assessment of irrigation water - Consumptive use and its determination - water requirement of various crops - Duty - Delta - Base period and crop period.

Functions and components of a diversion head work - Function - selection of site - type of weirs on pervious foundations - cause of failure - Bligh's creep theory and Khosla's theory - complete design of a vertical drop weir.


Types of canals - canal alignment - Kennedy's silt theory - Lacey's silt theory - Design of canals using the above theories - economical depth of cutting - canal losses - canal maintenance - lined canals and their design - silt control measures.

Canal falls - Necessity and location - Design of sand type fall - design of a cross regulator - cross drainage works - selection of suitable type of cross drainage work - canal outlets.

Note: Assignments include the design and drawings of various irrigation structures.

References


HM401 INDUSTRIAL ECONOMICS

Demand and Supply - Forecasting techniques
Cost and Revenues - Competitive nature of the firms - Keynesian economics - National Income
Trade cycle - Inflation - Index numbers Capital budgeting - Impact of Liberalization, Privatization and Globalization - Locating the firm in a global economy
Fiscal Policy - Taxation - Principles. Monetary policy - Functions of banks - Credit creation by commercial banks.

References


CE407 COMPUTER AIDED DESIGN – II

R.C.C: Slabs - Beams- Columns - Retaining walls.
Steel: Trusses - Beams - Columns - Column Bases - Plate girders - Gantry girders - Connections.
Transportation planning process- Trip generation and distribution- Network analysis - Shortest path algorithms.

Water resources - Pipe networks - Canal design - Backwater profile - Synthetic derivation of stream flows using random numbers - Dam stability

Analysis and design packages in Structural Engineering, Transportation Engineering, Water Resources Engineering and Geotechnical Engineering
References


SEMESTER VIII

MB491 MANAGEMENT CONCEPTS & PRACTICES


References


CE402 PRESTRESSED CONCRETE STRUCTURES

Principles of prestressing - Materials of prestressing - Systems of prestressing - Loss of prestress - Deflection of Prestressed Concrete members.
Slabs - Pre-tensioned and Post-tensioned beams - Design for flexure, bond and shear - IS code provisions - Ultimate flexural and shear strength of prestressed concrete sections - Design of end anchorage zones using IS code method.
Analysis of Continuous beams - Cable layout - Linear transformation - Concordant cables.
Design of compression members and tension members. Circular prestressing - Water tanks - Pipes - Analysis and design - IS Codal provisions.

References

ELECTIVES

CE352 GROUND WATER HYDROLOGY

Subsurface investigation - test drilling - resistivity logging - potential logging - temperature and caliper logging.
Steady unidirectional flow - well in a uniform flow - steady flow with uniform recharge - unsteady radial flow to a well - well flow near aquifer boundaries - Multiple well systems - partially penetrating wells - characteristic well losses.
Secular and seasonal variations - Fluctuations due to evapo-transpiration, Meteorological phenomena, tides, external loads and earthquakes - control by drains and wells.
Recharge through sewage pits, shafts and wells.
Occurrence of sea water intrusion - Ghypon-Heizberg relation between fresh and saline waters - shape length and structure of the fresh salt water interface - prevention and control of seawater intrusion - role of sea water in ground water - coastal zoning.

References

CE451 EXPERIMENTAL STRESS ANALYSIS

Strain gauges – Mechanical, optical, acoustic, electrical inductance and capacitance pneumatic types – description and working principles
Electrical resistance strain gauges, gauge characteristics and types – Equipment for recording static strain – reduction of strain gauge data.
Load, pressure and displacement transducers.
Model analysis – direct and indirect models – law of structural similitude – choice of scales – Model materials – limitations of model studies – Buckingham PI theorem – design of direct and indirect models – Beggs deformer and its applications.
Two dimensional photo – elasticity – optical principles stress optic law – Methods of producing isoclines and isochromatics using polariscopes – Methods of measuring fractional fringe orders – model materials – separation techniques
Fundamental of Photo elastic coatings, Moire fringe and brittle coating techniques – Introduction to stress freezing techniques – Introduction to non-destructive testings

References

CE452 EARTHQUAKE RESISTANT STRUCTURES

Seismic Design Concepts - Cyclic loading behavior of RC, Steel and Prestressed Concrete elements - Response Spectrum- Design spectrum - capacity based design.
Provision of Seismic Code frames, shear walls, Braced frames, Combinations - Torsion.
Performance of Regular Buildings 3D Computer Analysis of Building Systems (Theory only) - Design and Detailing of frames - Shear walls and Frame walls.

References

CE453 REMOTE SENSING AND GIS

References

CE454 ADVANCED FOUNDATION ENGINEERING
Sheet pile structures - cantilever sheet pile walls in granular and cohesive soils - Anchored bulk heads - Free earth support and fixed earth support methods - Anchors.
Cofferdams - types - cellular cofferdam - uses - Design by TVA and Cumming's method.
Well foundations - Types of caissons - Analysis of well foundations - determination of scourdepth - steining thickness - well sinking.
Foundations subjected to vibrations - elements of vibrations - Free, damped, free and forced vibrations - Design criteria - Pauw's analogy - IS Code of practice for impact and reciprocating machines.
Foundation drainage and water proofing - Dewatering well points system, sand drains.
Foundations in expansive soils - Mechanism - factors influencing swelling - Use of Geosynthetics.
Stability analysis of slopes - infinite slopes in sand and clays - finite slope - Swedish circle - stability of earth dam slope during steady and sudden draw down - friction circle method - Taylor's stability number. Sheet pile structures - Anchored bulk heads

References


CE455 HYDROLOGY

Derivation of unit hydrograph from complex storms - unit hydrographs for various duration - Synthetic unit hydrograph - Transposing unit hydrograph - Application of the unit hydrograph. Linear Regression - Statistical and probability analysis of hydrological data - Flood frequency probability and stochastic methods - Basics of Stochastic and Deterministic models.

References


CE456 WATER POWER ENGINEERING

Source of energy – Statistics of power - hydro power estimation of water power potential - mini and pumped storage plant - cost and value of water power.
Mini and Pumped storage plants- Penstocks - types and design criteria - anchor blocks - conduit valves - bends and manifolds - water hammer - Intakes - canals - forebay - trash rack tunnels - surge tank - power plant operation - surface and sub surface power stations.
Description and function of various hydraulic, electrical and mechanical equipment - power plant operation pertaining to base load and peak load
Principles included in the planning of a surface and sub surface power stations.
Elementary treatment of the principles involved in tidal power.

References


CE457 STRUCTURAL DYNAMICS

Dynamic analysis - Elements of vibratory systems and simple Harmonic Motion- Mathematical models of SDOF systems - Principle of Virtual displacements - Evaluation of damping resonance.
Fourier series expression for loading - (blast or earthquake) - Duhamel’s integral - Numerical evaluation - Expression for generalized system properties - vibration analysis Rayleigh’s method - Rayleigh - Ritz method.
Differential equation of motion - Beam flexure including shear deformation and rotatory inertia - Vibration analysis using finite element method for beams and frames
Evaluation of structural property matrices - Natural vibration - Solution of the eigen value problem - Iteration due to Holzer and Stodola
Idealization of multi-storeyed frames - analysis to blast loading - Deterministic analysis of earthquake response - lumped SDOF system - Design of earthquake resistant structures.

References

CE458 FINITE ELEMENT METHOD

Differential equilibrium equations - strain displacement relation - linear constitutive relation - special cases - Principle of stationery potential energy - application to finite element methods - Some numerical techniques in finite element Analysis
Two dimensional isoparametric elements - Four noded quadrilateral elements - triangular elements. Computation of stiffness matrix for isoparametric elements - numerical integration (Gauss quadrature) Convergence criteria for isoparametric elements.

References

CE459 MODELS FOR AIR AND WATER QUALITY

Estimation of system parameters - Streeter - Phelps model - oxygen 'sag' curve - determination of deoxygenation and reaeration coefficients - Benthal oxygen demand - mass transport mechanisms - Advevtive and diffusive mass transport
Models by O'connor, Dobbins and Thomann. Models for Estuary and Lakes: Physical chemical and biological processes in estuaries - water quality distribution in estuaries - modeling estuaries and lakes for water quality - temperature models for lakes and rivers Models for microorganisms decay, nitrogen and phytoplankton. Air quality models: Micrometeorological processes, wind rose, dispersion, coefficients and stability classes, Gaussian and dispersion model, Regional air quality models,

References


CE460 TRANSPORTATION PLANNING

Transportation Planning Process and Concepts - Role of transportation - Transportation problems - Urban travel characteristics - Concept of travel demand - Demand function - demand estimation - Sequential, recursive and simultaneous processes
Trip Generation Analysis - Zoning - Types and sources of data - Expansion factors - Accuracy checks - Trip generation models - Zonal models - Household models - Category analysis - Trip attractions of work centers.
Trip Distribution Analysis - Trip distribution models - Growth factor models - Gravity models - Opportunity models.
Mode Split Analysis - Mode split Models - Mode choice behavior, Competing modes, Mode split curves, Probabilistic models.
Traffic Assignment - Route split analysis: Elements of transportation networks, Nodes and links - minimum path trees - all-or-nothing assignment - Multipath assignment - Capacity restraint.

References


CE461 PAVEMENT ANALYSIS AND DESIGN

Pavements - Types and Component - Factors affecting Design and Performance of Pavements, Comparison between Highway and Airport pavements - Functions and Significance of Sub grade properties
Stresses in Flexible Pavements - Stresses and Deflections in Homogeneous Masses - Burmister's 2-layer, 3-layer Theories - Wheel Load Stresses, ESWL of Multiple Wheels Repeated Loads and EWL factors
Flexible Pavement Design - Empirical - Semi-empirical and Theoretical Approaches; Principles and procedure, design, Advantages and Applications of different Pavement Design Methods - Stresses in Rigid pavements - Types of Stresses and Causes - Factors influencing the Stresses, General conditions in Rigid Pavement Analysis, ESWL, Wheel Load Stresses, Warping Stresses, Friction Stresses, Combined Stresses
Rigid Pavement Design - Types of Joints in Cement Concrete Pavements and their Functions, Joint Spacings, Design of Slab Thickness, Design of Joint Details for Longitudinal Joints, Contraction Joints and Expansion Joints, IRC Method of Design
References

1. Yoder and Witezak, Principles of pavement design, John Wiley and sons, 1975

CE462 ADVANCED SURVEYING TECHNIQUES


Photogrammetry – Terrestrial and Aerial Photogrammetry – Horizontal position of a point from photographic measurement – elevation of a point – Determination of focal length of camera - Geometry and scale of vertical photographs – Ground co-ordinates from vertical photographs - Relief displacement – Planimetric mapping from vertical photos – Stereoscopic – Photo interpretation.


Geodesy – Figure of earth – Classification – Earth surface - Geodetic reference surfaces - Coordinate systems – Geodetic datums and elements – Map – Scale of map – projection – UTM – Map projection of India – Space Geodesy – VLBI – SLR - LLR.


References


CE463 STEEL-CONCRETE COMPOSITE STRUCTURES


Analysis and design of composite beams without profile sheet - propped condition – un-propped condition – deflection - design of partial shear connection.

Design of composite beam with profile sheet – propped and un-propped condition – deflection of composite beams – design of partial shear connection.

Introduction – Composite slabs – profiled sheeting – sheeting parallel to span – sheeting perpendicular to span – analysis and design of composite floor system.

References


CE464 GEOTECHNICAL EARTHQUAKE ENGINEERING


References

AR451 URBAN AND REGIONAL PLANNING


References

MA302 OPERATIONS RESEARCH TECHNIQUES IN CIVIL ENGINEERING

Inventory with uniform demand with finite rate of replenishment without and with shortage - Buffer stock
- Price break
Queuing Theory - M/M/1 and M/M/C models with infinite and finite waiting space.
Dynamic programming - Principle of optimality - recursive equation approach - application to allocation
shortest path and production schedule - Sequencing - Johnson's algorithm - n jobs through 2 machines,
n jobs through m machines, 2 jobs through 2 machines.
Replacement problem - Present worth factor - Group replacement - Nonlinear programming -
Lagrange's multiplier's method - Kuhn-Tucker's condition - Quadratic programming - Wolfe's method.

References


HM404 CREATIVE WRITING THROUGH LITERATURE

Understanding literary forms - Thinking about texts: Role-playing the Reader, the Author, and the
Individual as both the Reader-Author - Intensive reading of a poem, short story, a novel, a bestseller, a
film, a drama, an essay, a news story, an Ad-campaign, an Interview - Designing the individual reading
list. Pursuing one's own competence.
Dissertation: Performance in the chosen genre.

References