



**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS

of

BACHELOR OF ENGINEERING

(Fourth Year, VII AND VIII SEM Grading System)

College of Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Bachelor of Engineering

List of Subject (Fourth Year, Grading System)

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Unit I Highway Material

Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

Unit II Design Factors For Pavement

Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept.

Unit III Design of Flexible Pavement

Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – IRC Method (old) - CSA Method using IRC 37-2001, problems on above

Unit IV Design of Rigid Pavement

Principle – Factors - wheel load and its repetition – properties of sub grade - properties of concrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis – Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above. Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tandem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above

Unit V Highway Maintainance

Types of failures, causes, remedial/ maintainance measures in flexible pavements – Functional Evaluation by visual inspection and unevenness measurements - Structural Evaluation by Benkelman Beam Deflection Method, Falling weight deflectometer, GPR Method. Design factors for Runway Pavements - Design methods for Airfield pavements and problems on above.

Types of failures, causes, remedial/maintainance measures in rigid pavements – Functional Evaluation by visual inspection and unevenness measurements

List Of Experiments

1. Aggregate Crushing Value Test
2. Determination of aggregate impact value
3. Determination of Los Angeles Abrasion value
4. Determination of California Bearing Ratio values
5. Determination of penetration value of Bitumen
6. Determination of Viscosity of Bituminous Material
7. Determination of softening point of bituminous material
8. Determination of ductility of the bitumen
9. Determination of flash point and fire point of bituminous material
10. Determination of Bitumen content by centrifuge extractor
11. Determination of stripping value of road aggregate
12. Determination of Marshall stability value for Bituminous mix
13. Determination of shape tests on aggregate

References

1. Highway Engineering by Gurucharan Singh
2. Principles of Pavement Design by E.J. Yoder & M.W. Witzech
3. Highway Engineering by O'Fleherly
4. Highway Engineering by S.K. Khanna & C.E.G. Justo
5. Airport Planning & Design by S.K. Khanna & M. G. arora
6. Foresch, Charles "Airport Planning"
7. Horonjeff Robert "The Planning & Design of Airports"
8. Sharma & Sharma, Principles and Practice of Highway Engg.
9. Haung, Analysis and Design of Pavements
10. Relevant IRC & IS codes
11. Laboratory Mannual by Dr. S.K. Khanna
12. Highway Engg. By Hews & Oglesby
13. Highway Material by Walker

UNIT I Earth Pressure:

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Rebhoh's & Culmann Graphical method – pressure on the wall due to line load – Stability analysis of retaining walls.

UNIT II Stress Distribution And Settlement

Stress distribution - soil media, Boussinesq theory, Use of Newmarks influence chart, Components of settlement, immediate and consolidation settlement, Terzaghi's one dimensional consolidation theory, computation of rate of settlement. - \sqrt{t} and $\log t$ methods – e-log p relationship - Factors influencing compression behaviour of soils.

UNIT III Shallow Foundations:

Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

UNIT IV Deep Foundation:

Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

UNIT V

Soil Improvement Techniques : Compaction, Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

Soil stabilization : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

Soil Exploration and Foundations on Expansive and Collapsible soils : Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

List of Experiment

1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. To perform unconfined Compression Test
4. To perform Triaxial compressive strength test
5. To perform Vane Shear test
6. To perform CBR Test
7. To perform direct shear test
8. To perform consolidation test
9. Demonstration of undisturbed sampling
10. Demonstration of Plate Load Test
11. Demonstration of SPT & DCPT

Reference Books :-

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publications Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.
4. Geotech. Engg. by C.Venkatramaiah-New AGE International Publishers, Delhi
5. Found. Engg. by GALEonards McGraw Hill Book Co. Inc.
6. Relevant IS Code

Unit I Connection

Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections - Bolted, Riveted and Welded connections.

Unit II Compression member

Design of compression members, Effective length of columns, Design of columns-simple and compound, Lacing & battens. Design of footings for steel structures, Grillage foundation. Roof Trusses - Angular & Tubular, Lattice Girders.

Unit III Tension member & Girder

Tension members Design of simple beams, Built-up beams, Plate girders and gantry girders.

Unit IV Frames

Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers.

Unit V Method of Plastic Analysis

lower bound & upper bound theorems, Statical method, Mechanism method, combined mechanism, analysis & design of beam, Frames, Collapse mode & possible moment distribution.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.

References

1. Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
- ii) Design of steel structures by P.Dayaratnam
- iii) Design of steel structures Vol. I & II by Ramchandra
- iv) Design of steel structures by L.S. Negi
- v) Design of steel structures by Ramammutham
- iv) Design of steel structures by Punmia

List of Experiments:-

1. Design & drawing of various connections.
2. Design & drawing of tension member.
3. Design & drawing of compression member.
4. Design & drawing of grillage foundation.
5. Design & drawing of lacing & bracing.

(CE- 7041 Computational Methods in Structural Engineering)**Unit I Matrix formulation**

Matrix formulation for the principle of virtual work and energy principles, principle of contragradience, stiffness and flexibility matrices, Degree of Freedom. Axial, bending, shear and torsional deformations. Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions. Non-prismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

Unit II Direct Stiffness Method

Basics of the Direct Stiffness method - Analysis of pinjointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Nonsway)

Unit III Bandwidth, Symmetry & Imposition of Constraints

Concepts of Bandwidth, various storage schemes & equation solvers; Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

Unit IV Analysis of continuum structures

Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalized element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

Unit V Two Dimensional elements

Two Dimensional Iso parametric elements, shape functions for Simplex. Lagrangian and Serendipity family elements in natural coordinates, computation of stiffness matrix for Isoparametric elements, degrading of elements, plate bending elements. Finite difference & finite element method, comparison of analysis between Finite difference & finite element method.

Reference

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

(CE- 7042 Traffic Engineering)

Unit I Traffic Characteristics

- (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory.
- (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

Unit II Traffic Studies

- (i) Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

Unit III Traffic Operations and Control

- (i) Traffic regulations and various means of control. (ii) One way streets- advantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

Unit IV Street Lighting

- (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

Unit V Accident Studies & Mass Transportation

- (i) Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Reference

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S. Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R. Drew, Traffic Flow Theory
5. W.R. Mcshane and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

(CE- 7043 Industrial Waste Treatment)

Unit I Problem of Water Pollution

Effects of wastes on streams and sewage treatment plant. Natural purification of streams. oxygen sag curve. allowable organic load on streams classification of stream, stream standards and effluent standards. requirement of water for different purposes.

Unit II Measurement of Waste Water Volume

Sampling of waste waters, grab and composite samples. analysis of waste water. biochemical oxygen demand. chemical oxygen demand and pH value of waste, toxicity of waste by bioassay method. Pretreatment of Wastes: Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

Unit III Conventional Methods of Treatment of Waste Water

Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, advance methods of treatment, such as reverse osmosis, ion exchange, electro-dialysis, algal harvesting etc. low cost treatment plants. common effluent treatment plant, design and operation.

Unit IV Combined Treatment of Waste Water Sewage

Energy requirement optimization and budget, municipal regulation, sewer rental charge, instrumentation in waste water treatment plants, collection of data, operation and maintenance of plants, water pollution control board.

Unit V Treatment of Industrial Waste

Brief study of industrial processes and treatment methods of waste water from common industries, such as textile, dairy, paper and pulp, tannery, distillery. Hazardous wastes- Impact handling and disposal.

Reference

1. "Liquid Waste of Industries - Theories, Practice and Treatment" - N.L. Nemerow, Wesley Publishing Co.
2. Treatment of Industrial Waste - E.B. Besselièvre & Max Schwartz - Mc Graw Hill Book Company
3. "Waste Water Engg. - Treatment Disposal & Reuse" - Metcalf & Eddy - Tata Mc Graw Will, New Delhi
4. Waste Water Treatment - Arceivala - Tata Mc Graw Will, New Delhi
5. Industrial Pollution Control, hand book - Lund H.F. Tata Mc Graw Will, New Delhi

(CE- 7044 Cost Effective & ECO-Friendly Construction)

Unit I Concepts of energy efficient & environment friendly materials

Cost effective materials :- Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

Energy Efficient & Environment friendly building material products :- Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions.

Roofs - Precast R.C. Plank & Joists roof, Precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, Seasal Fibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

Unit II Cost effective construction techniques and equipments

(a) Techniques :- Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology.

(b) Equipments :- Brick moulding machine, Stabilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

Unit III Cost effective sanitation

(a) Waste water disposal system

(b) Cost effective sanitation for rural and urban areas

(c) Ferrocement Drains

Unit IV Low Cost Road Construction

Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

Unit V Cost analysis and comparison

(a) All experimental materials

(b) All experimental techniques

(CE- 7045 Environmental Impact Assessment)

Unit I Concept of EIA

Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

Unit II Methods of Impact Identification

Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

Unit III Impact analysis

Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

Unit IV Preparation of written documentation

Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

Unit V Public Participation in Environmental Decision making

Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work/ software package on any specific problem of importance

Objective: To develop physical fitness and mental peace among students

UNIT I

YOG & PRANAYAM::Introduction, benefits of pranayam, Asan

UNIT II

Meditation – Agnai, Asanas, Kiriya, Bandas, Muthras, benefits of Agnai Meditation

UNIT III

Benefits of santhi Meditation Kayakalpa Yoga Asanas, Kiriya, Bandas, Muthras
Meditation Santhi

UNIT IV

Meditation Thuriyam Kayakalpa Asanas, Kiriya, Bandas, Muthras Benefits of
Thuriyam

UNIT V

Meditation Thuriyam Kayakalpa Asanas, Kiriya, Bandas, Importance of Arutkappy &
muhurtas Meditation Santhi Kayakalpa Asanas, Kiriya, Bandas, Muthras

UNIT VI NATIONAL SPORTS ORGANISATION (NSO)

Each student must select two of the following games and practice for two hours per week. An attendance of 80% is compulsory to earn the credits specified in the curriculum. List of games:

- Basket Ball
- Football
- Volley Ball
- Badminton
- Cricket
- Throw ball

References

1. Prāṇāyāma Rahasya Book by Ramdev
2. Sampooran Yog Vidhya by Rajiv Jain Trilok
3. Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority by B.K.S. Iyengar

Unit I

Reservoir Planning: Investigations, Capacities, Zones of storage, Mass Inflow and Mass Demand curves, Life of Reservoir.

Earth Dams: Types, causes of failure and design criteria, soils suitability for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

Unit II Gravity dams:

Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, practical profile, evaluation of profile by method of zoning, foundation treatment, construction joints, galleries in gravity dams..

Unit III

Spillways: Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.design of outlets and rating curves.

Energy dissipators: Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions, Design of Sarda type Falls, Design of cross drainage works viz Syphon aqueduct and Canal syphon.

Unit IV

Structures on Pervious formations: Bligh's creep theory, limitations, Khosla's theory of independent variable, Khosla's corrections, Design of Weir and Barrages :design of waterways and crest levels, design of impervious floors and protection works.

Unit V

Canal Structures and Hydropower Plants: Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, general features of hydro-electric schemes, selection of turbines.

List of Experiments

1. To prepare a drawing sheet on various types of spillway
2. Stability analysis of gravity dam
3. Design & study of earthen dam.
4. Design of ogee spillway.

References:

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
5. Water Power Engineering by Dandekar

Unit I Railway

Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractive effort.

i) Rails: types, welding of rails, wear and tear of rails, rail creep.

ii) Sleepers: types and comparison, requirement of a good sleeper, sleeper density.

iii) Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.

iv) Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

Unit II Geometric Design (Railway)

Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and inter-locking.

Unit III Bridge Site Investigation and Planning

Loading Standards & Component parts: Selection of site, alignment, collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges. Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

Unit IV Substructures for bridges

Bridge Foundations, Construction, Testing and Strengthening of Bridges : Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and plants. inspection and Data collection, strengthening of bridges, Bridge failure.

Unit V Tunnels

Tunnels: Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts, Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

References

1. Chakraborty and Das; Principles of transportation engineering; PHI
2. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
3. Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
4. Ponnuswamy; Bridge Engineering; TMH
5. Railway Engineering by Arora & Saxena - Dhanpat Rai & Sons
6. Railway Track by K.F. Antia
7. Principles and Practice of Bridge Engineering S.P. Bindra - Dhanpat Rai & Sons
8. Bridge Engineering - J.S. Alagia - Charotar Publication House, Anand
9. Railway, Bridges & Tunnels by Dr. S.C. Saxena
10. Harbour, Docks & Tunnel Engineering - R. Srinivasan
11. Essentials of Bridge Engg. By I.J. Victor; Relevant IS & IRS codes

Unit I Water tanks

Design of cylindrical & rectangular tanks with different boundary conditions using IS 3370 tables. The tank resting on ground, underground & over head tanks.

Unit II

Intze tank: Membrane analysis with mention of continuity effects. Design of staging, columns, braces & raft foundations.

Chimneys: design for RCC & Steel

Unit III

Bunkers & Silos: principles of design of bunkers, silos.

Retaining walls: General types, structural behavior. Design of cantilever retaining walls & counter fort Retaining walls.

Unit IV Prestressed concrete

Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Unit V

Steel tank: Riveted, pressed & circular overhead tanks.

Design of formwork: Steel & timber formwork.

List of Experiment

1. Design & drawing of Tanks Resting on ground.
2. Design & drawing of Underground Tanks.
3. Design & drawing of Over head Tanks.
4. Design & drawing of Intze Tank.
5. Design & drawing of Bunker/silo.
6. Design & drawing of chimney (RCC).
7. Design & drawing of Retaining walls.

Reference

1. Design of Steel Structures – Ramammutham
2. Design of Steel Structures – Punia
3. Steel Str. by Ramchandra Vol II
4. Design of steel structures – L.S. Negi
6. Plain & reinforced concrete - Rammuttham
7. Plain & reinforced concrete – B.C. Punnia
8. Structural Design & Drawing by N.K.Raju.

(CE -8041 Structural Dynamics & Earthquake Engineering)**Unit I Single DOF systems**

Undamped and Damped, Response to Harmonic and periodic excitations, Response to Arbitrary, Step, Ramp and Pulse Excitations.

Unit II Multiple DOF systems

Stiffness and Flexibility matrices for shear buildings, free and forced vibrations-undamped and damped, Modal and Response History Analysis, Systems with distributed mass & elasticity

Unit III Numerical Evaluation of Dynamic Response

Time stepping methods, methods based on Interpolation of Excitation, Newmark's and Wilson - α method, Analysis of Nonlinear Response, Introduction to frequency domain analysis.

Unit IV Elements of seismology

Definitions of the basic terms related to earthquake (magnitude, intensity, epicenter, focus etc.), seismographs Earthquake Response of structures - Nature of dynamic loading resulting from earthquake, construction of Response spectrum for Elastic and Inelastic systems.

Unit V Earthquake Resistant Design of Structures

Earthquake Resistant Design of Structures, Design of structures for strength & serviceability, Ductility and energy absorption, Provisions of IS : 1893 and IS : 4326 for aseismic design of structures, Code for ductile detailing IS : 13920.

Reference

1. Chopra A.K., Dynamics of structures - Theory and Applications to Earthquake Engineering, Prentice Hall of India, New Delhi.
2. Berg G.V. Elements of Structural Dynamics, Prentice Hall of India, Englewood Cliffs, NJ
3. Paz Mario, Structural Dynamics, CBS Publishers, Delhi
4. Clough R.W. & Penzien J., Dynamics of structures McGraw Hill, New York.

(CE- 8042 Air Quality Monitoring & Control)

Unit I Air pollution problem

Economics and social aspects, historical episodes of air pollution. Sources of Air pollution, effects of air pollution on health, animal, plants and materials

Unit II Air Pollutants

Role of meteorological condition, properties of typical air pollutants, air diffusion and concentration pollutants. general diseases caused by air pollutants. toxicity of various pollutants. Plums patterns and height of chimneys.

Unit III Secondary Pollutants

Atmospheric chemistry, formation of secondary pollutants – PNN, PBN, Photolytic cycles, general diseases and toxicity of pollutants

Unit IV Sampling and Analyzing of Air Pollutants

Instruments pollution survey, standards of air pollution. Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.

Unit V

Air pollution control: Air pollution control legislation, public education pollution standards, status of air pollution control in various countries.

Industrial Hygiene: Concept and importance, factory Involved in environmental hazards, industrial ventilation occupational diseases, control methods.

Reference

1. "Air Pollution" - Faith W.L, John Wiley & Sons
2. "Air Pollution" - Mc Cabe L.C., Mc. Graw Hill, International
3. Air Pollution - Stern A.C., Academic Press N. York
4. Fundamentals of Air Pollutions - Raju BSN Oxford & IBH Publishing Co. Pvt. Ltd.
5. "Air Pollution" - Rao M.N. & Rao HVN - Tata Mc Graw Hill
6. Air Pollution – Wark and Warner

(CE- 8043 Energy Efficient & Green Building)

Unit I Energy efficient Green Buildings

The green Building concept, rating systems in India and world, GRIHA, LEED, etc. , green building rating agencies and some top green buildings in the world, sustainable practices used in the design and construction phases of Energy Efficient Green Buildings. Green Rating for Integrated Habitat Assessment (GRIHA), Energy Efficient Solar Homes & Buildings, Energy Savings in Homes, IGBC certification.

Unit II Energy Conscious Buildings

Climate and buildings in india, Introduction, Factors affecting climate, Climatic zones and their characteristics, Implications of climate on building design ,Urban climate ,Microclimate, Tools for analyzing weather data, Illustrative example, References Codes: National Building Code, Energy Conservation Building Codes, Key barriers to 'building green in India, Overcoming the barriers, implementation approach, etc.

Unit III Principles of Energy Conscious Design Of Buildings In India

Introduction Building Envelope, Site, Orientation, Building Configuration, Building Components, Passive Heating, Direct Gain ,Indirect Gain, Thermal storage wall, Roof top collectors, Isolated Gain, Solarium (Attached greenhouse / sunspace), Passive Cooling, Ventilation Cooling, Cross ventilation, Wind tower, Induced ventilation, Nocturnal cooling, Evaporative Cooling ,Passive downdraft evaporative cooling (PDEC) ,Roof surface evaporative cooling (RSEC) ,Direct evaporative cooling using drip-type (desert) coolers 3.4.3 Nocturnal ,Radiation Cooling, Desiccant Cooling, Earth Coupling, Earth-air pipe system, Day lighting, Basic Principles of Day lighting, Day lighting Systems, Building Materials, Embodied Energy of Building Materials, Alternative Building Materials

Unit IV Thermal Performance of Buildings

Introduction, Heat Transfer, Solar Radiation, Simplified Method for Performance Estimation; Example Computer-based Tools.
DESIGN GUIDELINES: Description of Buildings, Methodology, General Recommendations, Specific Guidelines.

Unit V Zero Energy Buildings

Opportunities and challenges in designing a Net zero building, Energy efficient solar homes/buildings, Design aspects ,Climatic zones ,Passive design features and, their advantages, Orientation of building, Sunshades, Window design, Double glazed windows Building insulation, Roof treatment ,Evaporative cooling ,Landscaping ,Surface to volume ratio Passive heating ,Earth air tunnel ,Solar chimney, Wind tower, Applicable passive features for various climatic zones, Energy-efficient lighting, Indoor lighting ,Outdoor lighting ,Energy efficient air conditioners, Selecting the right size, Selecting an efficient AC ,Installing an AC, Renewable energy devices/systems, Solar water heating system Building integrated PV system, Other renewable energy devices/systems.

(CE 8044 : Design Of Prestressed Concrete Structures)

Unit I Introduction

Principles of prestressing, Different methods of prestressing – post tensioning and pre-tensioning. Prestressed concrete materials. Need for high strength concrete and High concrete tensile steel. Creep and shrinkage of concrete, relaxation of steel. Losses of pre-stress friction and anchorage of steel.

Unit II Flexural strength of prestressed concrete section

Analysis of prestress, Resultant stress at a section, Line of Thrust, Load Balancing. Cracking moments. Shear strength and torsional strength of prestressed concrete section. Principle stresses and principal shear stresses, Ultimate shear resistance.

Unit III Stress Distribution

Stress-pattern in anchorage zones. Transmission length. End zone reinforcement. Stress distribution in end block.

Unit IV Design of members for flexure

Design of members for flexure. Code recommendations. Rectangular and I-section. Working out of section dimensions for concrete and prestressing forces for steel. Application to design of slabs and continuous beams and Bridge girders. Design for concordant table and tendon profiles.

Unit V Design of tension and compression members

Design of tension and compression members, Design for combined bending and compressive, Different approaches for design, Introduction to design of transmission poles, roof truss members, purlin, railway sleepers.

References

1. Lin T.Y., *Design of Prestressed Concrete Structures*.
2. Varatnam P., *Prestressed Concrete Structures*.
3. Ramarathan S., *Prestressed Concrete*.
4. Graduate I.I., *Prestressed Concrete*.
5. Krishna Raju, *Prestressed Concrete*.
6. Evans R.H. and Bennett R.S., *Prestressed Concrete*.
7. *IS-1343*.
8. Mullick S.K. and Rangaswamy R.S., *The Mechanics of Prestressed Concrete Design*.
9. Sinha and Raj, *Prestressed Concrete*.

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Unit I Precipitation / Flood analysis

Optimal Rain gauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Risk Analysis,

Unit II Flood Routing & Managements, Models in Hydrology

Flood Management, Flood Routing through Reservoirs, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc. Concept of Correlogram.

Unit III System Analysis

Need, Water Resources Systems, Optimisation Techniques, Linear Programming, Feasible Solutions, Graphical Method, Simplex Method, Use of of LP in Water Resources, Introduction to Reservoir Operation, Rule curves, Linear Decision Rule

Unit IV Dynamic Programming

Dynamic Programming & its utility in Resource Allocation and other Decision Making Problems, Optimal Operating, Policies, Use of D. P. in Reservoir, Operation.

Unit V Optimality Analysis & Updating of Network

Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

References

1. Subramany K., Engg. Hydrology.
2. Philipps & Ravindran: Operations Research
3. Hire D.S. & Gupta: Operation Research
4. Loucks D.P., Stedinder I.R. & Haith D.A : Water Resources Systems Engg.
5. Kottegoda N. T., Stochastic Water Resources Technology.
6. Singh V.P. : Elementary Hydrology

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work/ software package on any specific problem of importance